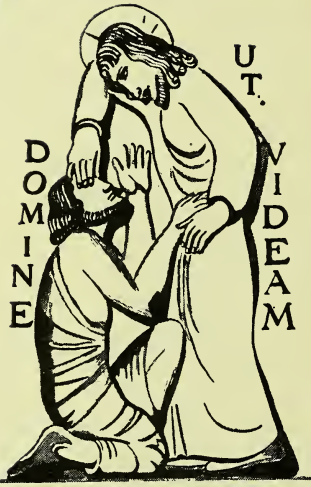

INJURIES OF THE EYES OF THE EMPLOYED, AND THE WORKMEN'S COMPENSATION ACT

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PROBLEMS IN PROGNOSIS

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FOREWORD

Diagnosis and treatment form no part of the purpose of the following pages, but it is impossible to exclude all allusion to them. The object is the humble one of trying to help the practitioner in cases of injuries of the eyes which may come into Court under the various Acts of Parliament. For questions relative to symptomatology and treatment the reader is referred to the text-books.

My grateful thanks are due to Dr. J. Jameson Evans for much valuable assistance with the proofs.

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CHAPTER I

Acts of Parliament—Giving Evidence—Industrial Diseases.

COMPENSATION Acts are the up-to-date rendering of the old Mosaic law "An eye for an eye," and they are based on the question how much has the workman and his dependent family lost by the effects of an accident.

The principal Acts of Parliament dealing with the rights of the employed, and the responsibility of the employer in respect to accidents to the former, are the Employers' Liability Act 1880, the Workmen's Compensation Acts 1897, 1900, and 1906. Under these Acts something like 150,000 accidents are dealt with every year, but fortunately not more than 1,000th part of this total comes into Court.

By the 1906 Act compensation is not payable for an accident or for illness which does not disqualify the employed for more than a week, but if the injury or illness exceeds a fortnight's duration he is then entitled to compensation dating from

the first day. The employer of one "hand" is liable under the Act as well as the employer of many. Agricultural labourers and domestic servants are included under the Act as are all persons paid by salary not exceeding £250 per annum, with the exception of soldiers, the police, out-workers (those not working at the employer's place of business), members of the employer's family dwelling in his house, and those who are only casually employed. This Act repeals the Acts of 1897 and 1900.

The surgeon called in to an injury to a workman's eye has to deal with medico-legal questions, and his opinion concerning prognosis is frequently more sought for than his view as to treatment. Whilst it may be, on the one hand, to the interest of the employer to minimize the seriousness of an accident, and whilst it may be, on the other hand, the object of the employed to exaggerate the result, it is the duty of the surgeon to look at the case from a judicial, as well as from a medical, point of view. No matter whether he is called in by the one side or the other his only duty is to be a witness, not for the plaintiff and not for the defendant, but for the truth according to his convictions. He must not undertake to appear as a witness to make the best of a case against these convictions; and

no matter which side engages him it is obvious that his only aim in giving evidence should be the truth, the whole truth and nothing but the truth. Pity may almost unconsciously bias him in favour of an unfortunate workman: indignation may prejudice him against the man whom he believes to be a malingerer: both must be ruthlessly cast on one side; he must obliterate all humanizing tendencies, and, leaving the legal rights to be safeguarded by the law, he must deal impartially with the abstract medical questions alone.

Questions relative to prognosis, when the effects of the accident are still going on, are always difficult to answer, and no absolute opinion concerning the final result can be given as long as there is the possibility of suppuration, of orbital cellulitis, of necrosis, of erysipelas, of cataract or of optic atrophy ensuing. Judge and jury require a maximum of fact and a minimum of opinion, but in matters of diagnosis and prognosis there is much scope for honest differences, and whilst a full acknowledgment of the cogency of the views of opposing witnesses should be given, the reasons for disagreeing with them should be stated in language understanded of the people. As far as possible words such as ecchymosis, traumatic, haemorrhage, haema-

toma, contusion, etc., should not be used. The judge and counsel will understand, and the jury may think the witness a very clever man, but they will not be able to form a correct estimate of the value of his evidence. No statement should be made that cannot be defended without straining points to support it.

"Never prophesy unless you know" is a very good rule, but unfortunately it is one which a medical witness called to give evidence under the Workmen's Compensation Act cannot follow absolutely. He can give probabilities and he may be able to cite percentages, and he can also confuse both by giving possibilities. Further he can seldom go, for though he may have the wisdom of Solomon he will find himself hopelessly outclassed by Old Moore and Zadkiel. Nevertheless he will be expected by judge, jury and counsel to give an opinion to the best of his ability, and it is with a desire to help the practitioner that the following pages have been compiled. In all injuries that are likely to become compensation cases full inquiry as to precedent sight should be made at the time of the first examination, before the patient has learnt that a congenitally damaged eye may be a valuable asset. This question of the amount of pre-existent vision

will probably demand some attention in the future. In deformities of the limbs or body the fact is usually manifest, but an amblyopia which may be congenital or acquired is often unknown even to the man himself. Amblyopia ex anopsia, which may have been associated with strabismus in childhood, in adult life may show no fundus changes whatever. A man with such an eye receives some slight injury, and he discovers, it may be for the first time in his life, that he cannot see so well with the one eye as he does with the other. What can be more natural than for him to conclude that the accident is the cause of his dimness of sight ? It may be a slight traumatic iritis which has drawn his attention to his eye, and when the iritis is cured his sight remains defective. The surgeon examines the eye and finds nothing to account for the loss of vision, and he may conclude that the man is malingering. Cases in which the visual acuity of one eye is less than it is in the other, and in which it cannot be brought up to the standard of the other by correction of the refraction, are of every day occurrence in ophthalmic practice, and in the interest of master and man some means, however crude, should be adopted to register the form vision of every workman employed under the Compensation Acts.

A very important clause in the last Workmen's Compensation Act is that which deals with certain industrial diseases acquired by workmen as a result of their employment. The diseases are as follows :— anthrax, lead poisoning, mercury poisoning, phosphorus poisoning, arsenic poisoning and ankylostomiasis.

Workmen acquiring any of these diseases are entitled to compensation exactly in the same way as if they were suffering from personal injury by accident arising out of and in the course of their employment. This recognition of industrial diseases is of far-reaching importance, and it is to be expected as time goes on that more and more diseases will be scheduled under the Act, so that in the end it may be that a workman who develops any disease during the time he is in the employment of any employer will be entitled to compensation. For if the principle of giving recompense in the case of any of the above-mentioned diseases is granted it seems impossible for long to exclude pneumonia, pleurisy, myopia, phthisis, bronchitis, laryngitis, emphysema, rheumatism, neuritis, anaemia, morbus cordis, ague, lumbago, neuralgia and a host of other diseases, any one of which may result from the nature of a man's employment, and may

interfere with his wage-earning capacity. When the workman finds that he receives compensation for disease or accident, whether temporary or permanent, the need for paying into sick benefit societies will seem to him to be superfluous. A few pence a week will secure him medical attendance, or he has the hospital to rely upon. What then will become of the great Benefit Societies, the Odd Fellows, the Hearts of Oak, the Shepherds, the Foresters and all the rest of them, which have been such a blessing to the workman in the past ? With old age pensions to look forward to in the future ; with complete insurance against accident and disease in the present, the coming workman will hardly need their help.

It may be that some great financier may arise and show us how to amalgamate all in one vast National Thrift Institution, under the management of the State and Capital and Labour, in triple alliance. Labour gives the pence it has previously given to its benefit societies, Capital pays the insurance money which it now subscribes under the Compensation Act, and the State makes up the balance. From the fund thus created the labourer draws his income in time of illness or accident, and when he is past work an old age pension, which

is not another name for out-door relief, cheers his declining years as he sits by his own fireside.

Such an Institution would unite Capital and Labour instead of dividing them as Compensation Acts do. The rates would be relieved when the interests of the employer, of the employed and of the community were united in a socialism that was not one-sided. No man suffering from disease or accident which unfitted him for work would go untreated, and thus lives and eye-sight would be saved for the benefit of the country.

It is to be expected that in the near future accidents to workmen in the United Kingdom will demand a very much more important consideration than they have received in the past. In Germany since the passing of an insurance law in 1884 there has been a 25 per cent. increase of illness from accidents, and there has been a considerable lengthening of the time required for convalescence. The same increase has been noticed in France since the passing of a law relating to accidents. The increase in the number of cases and the duration of time that the men are on the sick-list does not necessarily mean that they are malingering or that they are subconsciously exaggerating the seriousness of their accidents, for it is within the experience of all sur-

geons that many men insist on returning to work before they are fit because they cannot afford to remain ill. But when they can legally, and honestly, claim their wages, though ill, there is not the same necessity to resume their employment before they are quite well. The possibilities therefore of the future are important, and they affect not only the employer and the employed but they may be expected to increase very considerably the work of the club doctor, without, it may be taken for granted, any increase in the miserable pittance which he now receives for his labour.

Loss of an eye may be relatively a much more serious matter to one person than to another, according to whether the trade requires great or little accuracy of sight for its performance. Or again, the loss of a sound eye may leave an unfortunate man with an eye that has always been amblyopic. In all cases much depends on the intrinsic value of the uninjured organ. But if a workman loses an eye, no matter how good it may have been, if his work is not thereby interfered with, and he can continue his employment at the same wages, he is not entitled to any recompense beyond what he receives while he is on the sick-list.

There is no fixed value for an eye according to

British law; but in France, in most trades a man is supposed to lose about one-third of his efficiency by the destruction of sight in one eye, and he is therefore entitled to the capitalized sum of one-third of his wages.

Naturally the loss of two eyes is almost universally considered an infinitely more serious catastrophe. This view, however, does not seem to be without exceptions, for in a case under the Workmen's Compensation Act a claim was made by a labourer at Bristol in 1906 against a farmer. The labourer was born without sight in one eye, and while trimming a hedge a thorn injured the sound eye and he eventually became totally blind. He was awarded compensation at the rate of 7*s.* a week, this amount being half his weekly wage.

The man who has lost an eye may be able to perform his duty perfectly satisfactorily if, for instance, he is a signal-man and nothing else, because he has no need for orientation, and he has no necessity to recognize the third dimension ; but to a workman whose living depends upon the accurate co-adjustment of eye and hand, the loss of bin-ocular vision is a most serious matter. His appreciation of distance may be aided by parallax and other means, but these will not make up altogether for

the loss of convergence, and true stereoscopic vision is only the possession of the bin-ocular.

The capacity for working with one eye depends not only on the nature of the work but also on the personal equation, for whilst one mon-ocular man can acquire the faculty of judging distance and can project most accurately, another, not necessarily from natural obtuseness, is quite unable to learn to estimate the degree of accommodation he is exercising. The unconscious utilization of the mon-ocular parallax may enable one man to strike a rivet with accuracy while another will miss it by three inches. Under the Workmen's Compensation Act this question of personal equation with regard to the angle of projection has to be carefully considered in every case in which a workman who, having lost an eye, desires to continue his employment. In cases in which, although one eye has been seriously injured, yet sight in it is not altogether destroyed, the question whether bin-ocular vision still exists, must be investigated. The appreciation of " space " by workmen, whether they are bin-ocular or mon-ocular, is absolutely essential, and if it is non-existent deftness of work is unattainable. To measure the capacity of mon-ocular people Pfalz has invented a reliable instru-

ment, based on Hering's Drop Test, but it has not yet come into general use. Employers of labour would be well advised if in the future they never engaged apprentices or workmen without having them medically examined as to their fitness for the work for which it is intended to employ them.

A medical man is often asked by an employer of labour to see on his behalf a workman who is suffering from an injury. Before consenting to do so the medical man should remember that if the case goes into Court he will probably receive a subpoena and will have to give evidence and receive such fee as the judge may consider equitable. Consequently if for any reason the medical man does not wish to be called upon to appear in Court he must decline the first suggestion that he should see the patient at all. It is too late after he has once examined him. But if he is willing to give evidence provided a fee which he considers commensurate to the value of his time is offered, then, in order to safeguard himself, he should insist, before seeing the man, on receiving a written guarantee that in case his services are wanted in Court he shall receive a fee of £ for each day's attendance.

CHAPTER II

Black Eye—Fracture of the Orbit—Optic Atrophy—Septic Injuries—Meningitis—Optic Neuritis—Thrombosis of Cavernous Sinus—Injury of Supra-orbital Nerve—Neuralgia—Contre coup—Injury of Sphenoidal Fissure—Diplopia—Fracture of Malar—Exophthalmos—Pulsating Exophthalmos—Enophthalmos—Cellulitis—Periostitis.

A Black Eye.

A BLOW on the eye by some blunt instrument, such as the human fist, is usually followed by a condition of swelling and discoloration of the lids, the brow, and the cheek which all the world recognizes as a "black eye." And if the surgeon with a bent for scientific terminology refers to it in a court of law as a contusion with haemorrhage into the subcutaneous cellular tissue he must not be surprised if the presiding judge blandly explains that he means a black eye.

A black eye is a starting point for the consideration of the external injuries to which the eye is liable. If uncomplicated it is not likely to lead to

any difficulty in the relations between employer and employed. The blood-shot eye and swelling of lids will gradually subside as they pass through the familiar series of rainbow hues. But it is not always uncomplicated, and therefore it is the surgeon's duty as early as possible to make a thorough examination. If the lids are not too swollen to be opened, sight should be tested by means of the test types and a record made for future reference. If it is perfect, a good prognosis may generally be given; and another advantage of the immediate knowledge that sight is perfect is that any defect in that respect that is detected later will be known not to have preceded the accident, but is either the result of it, or exists in the imagination only, or is the fiction of a malingerer upon whom the possibilities of compensation have had time to dawn. And here it may be well to state that a defect which has no real existence may yet honestly exist in the imagination of the sufferer. Call him hysterical, call him neurotic, or call him anything else, the man, as well as the woman, exists, who, with the best intentions in the world, cannot give an accurate account of his symptoms. It is the surgeon's duty in such cases to decide whether the inaccuracies are due to that sub-conscious mimicry of a non-existent

disease which we call hysteria, or to the conscious simulation which we call malingering.

But although a black eye, when it is a black eye and nothing more, is a simple matter, yet it is often the outer and visible sign of an inner and more serious injury. It is these more serious complications which entitle the sufferer to compensation under the various acts of parliament which have been framed for the benefit of the employed.

All parts of the organ may suffer from the injury which has produced a black eye, and all parts must be most carefully examined at the earliest possible time after the accident. If nothing but the black eye is found to be the matter, still that is sufficiently severe an accident for the surgeon to insist that the workman shall cease work for a few days, during which time he should be kept under observation, until the symptoms have subsided. The eye is the workman's most valuable asset and his best trade instrument, he cannot therefore afford to run any risk with so important an organ. There is, too, the employer's interest to be safeguarded, and he also cannot afford to run unnecessary pecuniary risks for the sake of a few days' labour. He has probably insured his men against accidents, but as a busi-

ness man he recognizes that his interest and the insurance company's are one.

In medico-legal disputes it should not be forgotten that a black eye may occur without any direct blow, as a result of straining or coughing, etc., or from blows on the back of the head, and it is frequent in fractures of the base of the skull. Again, without any manifest complication a concussion of the eye may be followed by a serious functional disability. It is not uncommon to find when the eyebrow has been struck that a clean cut has been produced by the sharp edge of the superciliary arch, that is, an incised wound has been made from within outwards, instead of in the more usual manner from without inwards. Such wounds are more serious than those produced in the ordinary manner. Disputes as to their origin are likely to occur, and doubts may be thrown on the statement of the man as to the cause. Such an incised wound is usually accompanied by considerable damage to the surrounding parts of the soft tissues, and the convalescence is apt to be a prolonged one. Often, too, the periosteum is bruised or torn, and periostitis and necrosis are occasional sequelae. An early favourable prognosis should never be given in such injuries.

"Black eyes" which do not appear until some days after the injury should be carefully investigated, for the late appearance of ecchymosis sometimes portends an orbital fracture.

Fracture of the Orbit.

Should the blow we are considering be sufficiently severe the orbit may be fractured and the result may be fatal. Or if not fatal, such injuries may be serious in many different ways. A compound fracture may lead to suppuration, to necrosis and to a long-lasting fistula; or erysipelas may ensue, and it is worth remembering that erysipelas is a more frequent sequela of wounds involving the inner than those involving the outer angle of the eye. Fractures through the optic foramen are a frequent source of blindness, which may be immediate from involvement of the optic nerve in the fracture, or may be of slower onset either by compression of the nerve by bleeding or by retro-bulbar neuritis or by pressure of callus thrown out during the process of healing.

Although pressure from the effused blood may not be sufficient to interfere directly with the function of the nerve, it may be sufficient to compress the central artery of the retina, when symptoms

similar to those of embolism will equally justify a bad prognosis. It is probable that bleeding into the nerve sheath never occurs without a fracture, but it is not always possible to say which of these conditions has produced the blindness, and for that reason the prognosis should not be too pessimistic. If the fracture has included a rupture of the nerve, the result will be permanent; but if the blindness is caused by pressure from effusion of blood, there is the hope that as the blood becomes absorbed the sight may return. Should, however, no improvement of sight occur, it will not be many weeks before the signs of optic atrophy remove the last lingering hope of restitution.

Before giving a decided prognosis in cases of fracture of the orbit the field of vision should always be examined. If no contraction occurs within two months of the injury, and if the other symptoms have subsided, there is good hope that atrophy of the optic nerve will not ensue. But if the field of vision is found to be less extensive than that of the other eye a guarded prognosis is justified. Some contraction of the field may be explained by hystero-traumatism, and if colour perception for red and green shows a normal rela-

tive proportion to the white field, the prognosis is good; if, however, the colour field is contracted out of proportion to the white, the suspicion of atrophy is confirmed. If, moreover, the field for white is perfect when a good illumination is used in testing it, and very considerable contraction is found with a somewhat less perfect illumination, the prognosis must be a cautious one. Further examinations should be made later, and then if the contraction of the colour field has progressed out of proportion to the progress of the contraction of the white field, the condition is serious, for the atrophy is increasing rapidly, and consequently the prognosis must be a bad one. But if it is found that although there is a further contraction of the colour field, yet the decrease has been pari passu with the contraction of the field for white, then, although the atrophy is certainly going on, it is not advancing so rapidly. If on this second examination, on the other hand, although there may not be any increase in the white field, yet if the colour field has expanded, the prognosis is a decidedly hopeful one. If central vision diminishes pari passu with contraction of the field of vision, the atrophy may be presumed to be affecting the whole of the optic tract. Should deterior-

ation of vision be greater than a small contraction of the field seems to warrant, examination for a central scotoma for colour should be made, and if with a small test object a horizontally oval one is found, strict inquiry should be made with regard to the patient's use or abuse of alcohol and tobacco. In examining the field of vision, that of the sound eye should always be taken for comparison. In fractures through the optic foramen, sight is lost on the side of the fracture, the pupil is usually dilated and does not contract to the stimulus of light, but if the sound eye is exposed to light, a contraction of both pupils will occur.

It is probable that fractures of the roof of the orbit are more frequent than is usually suspected; but the more severe ones are often most serious because of the contiguity of the brain and the thinness of the bone. Perforating wounds here are very frequently fatal, and although at first the patient may seem to be progressing favourably, yet brain symptoms, the result of thrombosis or of cerebral abscess, may manifest themselves days or weeks after the injury. Fractures of the roof, too, are the most frequent ones to involve the optic foramen, and therefore they are the ones

in which sudden blindness of the eye most often occurs. The ophthalmoscopic appearances in these cases may be a help in forming a prognosis as far as sight is concerned, for if there are retinal haemorrhages, the hope is that the injury to the optic nerve is not a rupture but a pressure from blood in the sheath, and that as time goes on the absorption may relieve the pressure and enable the nerve to resume its function. But too much importance must not be placed on the presence of these haemorrhages, as they may be present in the case of fracture, and may be absent in cases of haemorrhage into the sheath of the optic nerve. Crepitus may or may not be present. In the latter case it is not always easy to diagnose a fracture of the orbit, but if there is sufficient intra-orbital haemorrhage to cause proptosis, it is probable that some part of the orbital wall is broken.

Fractures of the outer wall are generally easier to diagnose than those of other parts. The inner wall fractures are frequently associated with epistaxis and emphysema, as also are those of the floor, but in the latter case it is usual for the malar or superior maxilla to be involved also.

Blows on the head will sometimes, without causing fracture, produce one-sided partial blind-

ness and atrophy of the optic nerve, or a paralysis of one of the oculo-motor nerves by some ill-defined injury at the base of the skull, or by haemorrhage into, or irritation of, the nucleus of origin. At other times nystagmus, which may be transient, follows a blow on the head.

Blows on the external angular process of the frontal bone, Jameson Evans has pointed out, are sometimes associated with a partial temporal blindness, the field of vision occasionally being almost completely hemianopic in the eye on the injured side. This partial blindness comes on at once, but there are no ophthalmoscopic changes to be seen for a few weeks when some amount of atrophy of the nerve-head occurs. These cases generally improve as far as central sight is concerned, although the temporal blindness remains permanent. They are therefore, from a prognostic point of view, hopeful ones to deal with. They show, too, the value of the perimeter in judging the probable course of events, for most other injuries of the optic nerve go on to complete atrophy. Jameson Evans is of opinion that the probable cause of the temporal blindness is a bruising of the nasal side of the optic nerve by being driven against the inner edge of the optic foramen.

The blindness which since the days of Hippocrates has been observed occasionally to ensue after a blow was thought to be due to an injury of the supraorbital nerve. The ophthalmoscope has taught us that this is not the case, but that the blindness may be due to many lesions. Sometimes there is a fracture of the orbital canal with injury of the optic nerve, and sometimes there is a haemorrhage pressing upon it. At other times the blindness is due to a choroidal rupture, or it may be a retinal detachment or a vitreous haemorrhage. Fractures which involve the cranial wall are of most serious import, and when they are caused by a penetrating septic body, such as wood, they are occasionally rapidly fatal, either from meningitis or from septic absorption.

An injury caused in such a way may, on rare occasions, injure the internal capsule and produce a hemiplegia of the opposite side. In such a case some improvement may occur, but the limbs are not likely to recover completely.

Traumatic meningitis is sometimes followed by optic neuritis, which may gradually subside or go on to atrophy, due to inflammation passing down the nerve to the papilla. In some cases a bi-temporal hemianopsia may be produced by a

meningitis near the anterior part of the chiasma (or a periostitis may produce it). If the disease subsides, the hemianopsia may remain permanently, but vision may be otherwise preserved; nevertheless, it is too often the case that the atrophic process proceeds and ends in complete blindness.

Traumatic meningitis, too, may give rise to a purulent irido-cyclitis, hypopion, and hyalitis ending, either in a pseudo-glioma or a general ophthalmitis. The prognosis in a general inflammatory condition of the eye, the result of meningitis, is bad. Fortunately it is only on very rare occasions that both eyes are attacked.

Optic Neuritis

is of very frequent occurrence in injuries affecting the eyes, and it is caused by varying processes. But whatever the cause a severe optic neuritis, although other symptoms are satisfactory, is always an alarming one. It cannot be considered apart from the exciting cause, and if there is reason to suppose that there is excessive intra-cranial pressure, due to abscess of the brain or growth, accompanied by vomiting and headache, the pressure must be relieved, if possible, without delay. Unless this is done a favourable prognosis, as far as

sight is concerned, cannot be given. Such a case is as urgent as is an optic neuritis which is caused by tumour, and in both cases a favourable prognosis depends upon an early trephining, for in both the future, as far as sight is concerned, is dark if an operation is delayed or omitted altogether. Such a trephining should be done when there is no possibility of getting at the seat of the mischief, or of draining an abscess, with the intention of relieving pressure. It is often gratifying to find that a simple trephining produces immediate relief of headache and at the same time prevents optic atrophy from ensuing.

But the optic neuritis may be due to other causes than abscess or tumour, and if there is reason to suppose that it is caused by meningitis or orbital cellulitis, or thrombosis of the sinuses it is hopeless to expect to save sight by trephining. As a rule in these cases the prognosis as regards life overshadows the almost equally important one of sight. It is a doubtfully successful issue if life be saved but vision lost. In a large number of cases sight may be saved by an early trephining, and it cannot be too strongly insisted upon in many cases of severe traumatic optic neuritis.

Optic neuritis is not of much value as an aid to

localization of an injury, but in cases of doubt as to the situation of an abscess, if it be present, it is rather more in favour of the cerebrum being the site than the cerebellum.

Infective Thrombosis of the Cavernous Sinus

is one of the most serious results of an orbital fracture, and it is one which calls for almost the most grave prognosis it is possible to give. A fractured orbit may seem at first to be progressing satisfactorily, but gradually an infecting process, spreading backwards, either by way of the ophthalmic veins, or possibly along the sheaths of the nerves, alters the feature of the case and replaces hope by fear. In a case which has escaped primary infection it sometimes happens that a caries of the sphenoid may set up an infective meningitis and a thrombosis of the cavernous sinus. When once thrombosis is established the case may run a rapid course and death may ensue within a few days, or a more protracted course may follow which extends over several months.

Happily thrombosis is not a common sequel of fracture, and probably cavernous sinus thrombosis is rarer than thrombosis of any of the large sinuses,

but still it is to be remembered in forming an early prognosis in cases of fracture of the orbit.

Infective thrombosis occurs principally in adults, rarely however in old men.

Injury of the Supra-orbital Nerve

may cause a neuralgia which prevents a workman from following his employment without there being any objective sign. They are often long cases to deal with, but eventually they get well. If a foreign body is left in the wound, it is probable that the symptoms will continue until nature or the surgeon removes it.

Fractures of the orbit may be caused by direct blows and they may, too, be due to blows on distant parts of the head or cheek, the fracture extending to the bones of the orbit. In this way fractures of the base very frequently include the orbit on both sides, and they may produce blindness in each eye. Fractures of the body of the sphenoid may cause hemianopsia or blindness by injury to the chiasma; and those near the sphenoidal fissure often injure the attachments of the muscles and so produce all the troubles associated with diplopia. Whether the actual cause is direct injury to the muscle or whether the diplopia is produced by injury to the

nerve a very serious disabiilty occurs from the workman's point of view. As a consequence he finds it impossible to work unless one eye is covered. Double sight is especially associated with paralysis of the external rectus, owing to the exposed situation of the sixth nerve. All cases will require a period of waiting, irritating alike to employer and employed, before any operative means can be resorted to to remedy the diplopia, and even after all the result may not be as perfect as was anticipated. Finally the workman may have to return to work with a patch over the injured eye. Practically this means to him that as far as work is concerned he has lost an eye. Diplopia is sometimes a late sequela of an accident, coming on, it may be, some weeks after the accident. There are few more serious accidents to a workman, short of the absolute loss of an eye, than one which causes diplopia. The eye, it may be, appears to be absolutely parallel with its fellow, and indeed it may be, and yet whenever he attempts to follow his trade the troublesome double sight prevents anything like accuracy of manipulative work. An operation, or prisms, may theoretically cure the squint, and his sight is perfect if he does not want to make use of his field of fixation. And so, as long as he looks straight in front of him

there may be no diplopia, but let him look to the right or to the left and his disability declares itself. Aesthetically his eyes are perfect, but for utilitarian purposes they are hopeless.

Fractures of the Malar Bone

are occasionally met with as a result of a severe blow, and they may cause extensive intra-orbital haemorrhage. At the same time the infra-orbital nerve may be injured, or the inferior oblique may be injured and diplopia may ensue. Nevertheless, although there may be some deformity, these cases may be expected to heal satisfactorily, although the anaesthesia produced by the ruptured infra-orbital nerve is likely to be permanent.

Exophthalmos

is a result of proptosis, but the two words are often used synonymously. This displacement may be caused by infiltration of the orbital cellular tissue with blood or pus. But supposing the injury to be an aseptic one, and no after septic infection to take place, whether the proptosis is due to haemorrhage or a cellulitis that has not gone on to suppuration, the probability is that the eye will gradually withdraw into the orbit. Proptosis due to intra-orbital haemorrhage usually subsides quickly, but during

the displacement damage may have been caused to the optic nerve and the eye may become blind from optic atrophy. Or again, a corneal abscess may result from the inability of the lid to protect the proptosed eye from exposure and consequent irritation from dust. If on the other hand the proptosis is caused by pus the outlook is not only serious to sight but also to life. The pus may make its way backwards, and it may not be long before a suppurative meningitis renders the case hopeless. Early treatment alone can justify a favourable prognosis.

The extreme proptosis one sometimes sees in cases of periostitis is generally a sign that suppuration has begun and that surgical interference is urgently needed. The proptosis comes on more quickly than it does in orbital cellulitis and the prognosis is more grave. The proptosis of cellulitis is not only slower in appearing but it is also usually less painful. The eye is pushed in a direction opposite to the site of the periostitis ; in cellulitis it is pushed out in a straight direction. The exophthalmos which occurs when the eye has been gouged out of the socket, by a large penetrating foreign body, is frequently accompanied by a rupture of the sclera, and is naturally a most serious accident. The lids are often contracted behind the globe. If there is

no rupture of the sclera, it is possible that the globe may be replaced and that no permanent damage may have been done, but a positive prognosis should be withheld for several weeks.

Traumatic Pulsating Exophthalmos

is one of the rarer results of a fracture of the base of the skull, and the symptoms of that injury are usually present. More rarely pulsating ophthalmos may also be produced by a punctured wound of the orbit in which a foreign body has pierced the internal carotid and the cavernous sinus. The exophthalmos may be single or double, and the symptoms appear soon after the accident. Occasionally the onset may be postponed, and it may then come on insidiously. Immediate blindness usually signifies that the optic nerve has been ruptured. Sometimes a case may be cured by rest and medical treatment, but even then it may be with the loss of sight. More often surgical help will have to be resorted to and no prognosis can be given until an operation has been undertaken. Complete restoration of sight has been known to follow operation. If the exophthalmos is left untreated, it is to be expected that the condition will go on increasing until the lids are unable to close and a state of lagophthalmos is estab-

lished. Diplopia from the displacement is an early complaint, and then later the cornea, unprotected by its natural shield, becomes irritated by every passing particle of sand or dust, and so a chronic keratitis gradually destroys the transparency of the cornea, and obliterates the diplopia by annihilating the function of the protruding eye.

As long as a man has a pulsating exophthalmos he is unfit for work; no matter how insignificant the other symptoms may be, yet as long as the exophthalmos is qualified by its adjective the bed and the sofa must be the daily routine of the workman's circumscribed life. At any moment death may occur from cavernous sinus haemorrhage.

Compression of the common carotid may cure, but it is less successful than in idiopathic cases. Ligation of one or both common carotid arteries, on the other hand, may be resorted to with a good hope of success.

Traumatic Enophthalmos.

Cases of traumatic enopthalmos may be divided into two classes: (1) Those that are the immediate result of an injury; (2) Those that do not manifest themselves until sometime after the injury. In the case of immediate enophthalmos it is either due to a

fracture of the orbit, the eye being driven back into the socket, or even forced into the antrum through a fracture of the floor of the orbit, or the condition is due to a paralysis of Müller's muscle, as a result of an injury of the sympathetic nerve. In the latter case the enophthalmos sometimes disappears in a few days. In the cases in which the enophthalmos does not appear until some time after the injury there are again two probable causes for it: (1) It may be due to cicatricial bands, the result of cellulitis, which by contracting drag the eye backwards into the orbit; or, (2) it has been suggested by Nieden that it is the result of a trophic disturbance of the ocular tissues, and that the eye merely sinks back into the space produced by the shrinking of the orbital contents. In either of these latter cases the enophthalmos is usually permanent, but if sight has not been immediately interfered with at the time of the injury it is not likely to be affected later on.

Orbital Cellulitis.

Orbital cellulitis may be produced by a perforating wound, with or without fracture, or by a blow or by a backward extension of suppuration. In its acute phase it is not only a very painful affection

but also a very serious one. No prognosis can be given during its acute stage, for it may be the precursor of death by sinus thrombosis or by meningitis. When chronic, its symptoms are occasionally very obscure and require careful study, or a diagnosis of malingering may be most unjustifiably made in the case of a workman who has had, it may be, a slight injury some weeks or months before he presents himself to the surgeon. The patient complains of vague deep-seated pain, there may be some tenderness on touching the eyes, but perhaps no, or scarcely any, swelling of the lids and no proptosis. The symptoms are almost entirely subjective, the man may have the character of being a shirker of work, and if it is also known that he draws a bigger income from club money and compensation when on the sick-list than he can earn when well, the conclusion might seem clear that the man is malingering. If a positive opinion to that effect be given, it is disconcerting for the surgeon when the pointing of an abscess demolishes the diagnosis. Cerebral symptoms coming on in a case of orbital cellulitis are a sign of commencing thrombosis of the cavernous sinus, and a very serious prognosis should be given as the case will probably be fatal.

Although the prognosis of orbital cellulitis is

favourable in the milder cases, yet if it is secondary to erysipelas the case is likely to be a most anxious one, and only a guarded opinion should be given in the early stages. In a considerable percentage of the cases death will ensue. Cavernous sinus thrombosis, an acute phlegmonous inflammation with much sloughing, phlebitis of the orbital veins, meningitis, encephalitis and panophthalmitis are amongst the pathological prognostic possibilities, and due weight should be given to symptoms pointing to their onset.

If the pain is not great, and the proptosis not marked, it is probable that the cellulitis will subside without the formation of pus.

Traumatic Periostitis.

It is not always easy to distinguish between orbital cellulitis and periostitis, but the distinction is an important one and no prognosis can be made until any doubt on the question is cleared up. In cellulitis the displacement of the eye is generally directly forwards, while in periostitis it is in a direction opposite to the swelling. A periostitis of the roof of the orbit pushing the eye downwards, while a periostitis of the outer wall displaces it inwards.

Periostitis is often a more limited lesion than cellulitis; pain is an earlier symptom, and it is worse at night. The bone in the neighbourhood is much more sensitive to pressure, but the tendency to the formation of pus is not so marked. In considering the prognosis from the workman's point of view it is to be remembered that a case of periostitis is likely to be more prolonged than a case of orbital cellulitis; the exophthalmos appears earlier, and if the periostitis is near the margin of the orbit, it is apt to lead to ectropion. Orbital periostitis generally spreads to the cellular tissue and sets up cellulitis, but cellulitis rarely sets up periostitis or osteitis.

Traumatic periostitis is almost always a slow, frequently an alarming, and sometimes a fatal disease. From a prognostic point of view the most favourable position for it is marginal. Here it is not so dangerous to the brain, nor is it so likely to affect the optic nerve. The thin orbital roof when attacked may be quickly perforated, resulting in abscess of the brain or meningitis; whilst a deeper-seated periostitis seldom causes meningitis by extension backwards through the optic foramen, yet it may press on the optic nerve threatening, and frequently causing, blindness. Coming on after a blow in a syphilitic man it is apt to give rise

to difficulty, not only of prognosis, but also as to the man's right to compensation. There seems no doubt that such men are more likely to have a periostitis induced by a slight blow than are healthy men, and the surgeon is confronted by the questions: Is the periostitis to be considered to be due to the blow or is it caused by syphilis, and what are the rights of the master and man in such a case? There is no doubt about the blow and there is no doubt, it may be, that so slight a blow would not have produced periostitis in a healthy man, and he has a periostitis which may be indistinguishable from a gumma. If he had not received the blow, he would not have had the periostitis, though probably he would not have had the periostitis if he had not had syphilis, yet it was in consequence of the injury that he is now on the sick-list, and therefore the master must pay.

Fortunately gumma of the orbit is not common; it is certainly rarer than in the other cranial bones. But the importance of its recognition is great in the interest of employer and employed. Though usually a third stage symptom it may nevertheless be one of the earliest manifestations after the primary stage of syphilis has passed; and if in such a case a history of a slight blow is given, it is as

probable as it is excusable for a surgeon, if the man denies infection, to come to the conclusion that he has a case of traumatic periostitis to deal with. In the hereditary form of syphilis the orbital bone lesion is often a still more severe manifestation, and if it is diagnosed as a traumatic case, not only will the course be a prolonged one, but also the inappropriate treatment is likely to be disastrous.

In forming a prognosis in the early stages of periostitis, in addition to the possibility of suppuration, followed by chronic necrosis or caries, it is necessary to take into consideration the frequency with which an orbital cellulitis ensues. Something may be learnt as to the seat of the periostitis when suppuration is pointing in the conjunctiva. For in that situation the mischief is certainly deeper in the orbit than it is when it points through the lid, that is in front of the tarso-orbital fascia. Another point to remember is that periostitis in the neighbourhood of the tarso-orbital fascia is a frequent source of ectropion. An early escape of a sequestrum justifies the hope that the case will be a short one. Necrosis is more likely to be a sequel of periostitis in adults, and caries in children.

CHAPTER III

Conjunctivitis—Pterygium—Incised Wounds of Lids—Burns of Lids—Injury to Punctum—Injury to Canaliculus—Injury to Palpebral Ligament—Emphysema of Lids—Erysipelas—Ptosis—Ankyloblepharon and Symblepharon—Entropion and Ectropion—Lagophthalmos—Penetrating Wounds of Orbit—Injury to Optic Nerve—Foreign Bodies in Orbit—Injury of Lachrymal Gland.

Injuries of the Eyelids

do not usually permanently interfere with the wage-earning capabilities of the workman, unless the secondary results, such as cicatricial contractions produce an entropion, an ectropion, or an inability to close the lids and finally a roughened condition of the cornea from the constant irritation of dust. Stone-sawyers and all workmen following dusty occupations should change their work if they cannot fully close their eyes.

Traumatic Conjunctivitis

may be due to mechanical, chemical or thermal causes, the second and third being more usually

the source of claims for compensation than the first. The important points to observe in forecasting the future are the extent and the depth of the injury ; for any ill effects that ensue will probably be due to contraction of the scar or to adhesions between the lids and the globe. As these are late results a prognosis should not be given until the probable trend of events is clear. Slighter degrees of conjunctivitis are of little consequence and heal quickly, and they do not usually prevent a man from following his occupation.

Conjunctival inflammation is a frequent source of claims under the Workmen's Compensation Acts, and it requires very careful examination in order to decide, first, whether it can fairly be considered traumatic, and, secondly, whether the traumatism was the result of an accident during work. An intentional injury to the conjunctiva is sometimes produced by the introduction of foreign bodies, such as sand, for the purpose of shirking work or of gaining compensation. The difficulties that may arise in dealing with these cases may be gathered from the following instance :—

A man employed at some works, where refuse was destroyed in a furnace and then ground into powder for the manufacture of concrete, was sent

to me by his doctor with the history that a down blast from the furnace had blown some dust into his eyes ten days previously. He was found to have a palpebral conjunctivitis of both eyes, and he worked in an atmosphere always saturated with dust. There seemed no doubt that the dust was the cause of his conjunctivitis, and that it was therefore traumatic. Was he consequently entitled to compensation? On going into the question it appeared that after receiving the blast he continued his work as usual, went to it again next day, and continued until I saw him on the tenth day and suggested that he should stop. His doctor saw him on the day of the occurrence, which was a point in his favour, but it was not necessary to remove any dust from his eyes. Particles from a furnace would probably be aseptic, although they might of course start a conjunctivitis. But there are many people who cannot work in a dust-laden atmosphere without getting conjunctival irritation, and if we say that all these are cases of "accident," and entitled to compensation, then we must recognize that he who works in a mason's yard and gets stone-mason's phthisis, and he who when at work gets knife-grinder's phthisis are alike eligible for compen-

sation. If we admit men suffering from disease of occupation we can hardly refuse the man engaged in ditching who developes rheumatism. The man who when working suddenly receives dust in one or both eyes which causes him immediate discomfort and which may require that the particles shall be removed, is clearly suffering from an "accident"; but he who, from the nature of his work in a dusty air, gradually develops conjunctivitis is, it seems, as clearly suffering from a disease of occupation. But after all the line of demarcation is a very fine one, and many diseases of occupation are really chronic accidents.

In cases of purulent conjunctivitis of doubtful origin an examination should be made for Weeks's bacillus, for the gonococcus and for Klebs-Loeffler bacillus.

Pterygium.

Some amount of pterygium is not at all uncommon in those who are employed in dusty occupations, and it is an especially frequent complaint with stone-masons engaged in working a sedimentary stone such as oolite. It is rarer amongst men engaged with volcanic rock. In addition to dust pterygium may also be caused by a scald, or by

pungent vapours, or by smoke. As an aid to the determination whether a given case is due to a scald it should be remembered that in such cases it is usually on the temporal side; whereas in cases due to dust and other air-borne particles it is commonly on the nasal side. A patient with a pterygium which is advancing over the cornea who is not benefited by operation or other treatment should change his dusty occupation before the advancement of the disease has begun to interfere with his sight. No workman whose eyes are easily irritated, and, still more, no workman who has already lost an eye, should engage in any workshop where fortuitous atoms are apt to fly about.

Incised Wounds

of the lids usually end satisfactorily; they heal quickly and do not leave very disfiguring scars. But if they are situated near the palpebral fissure there is the possibility of ectropion ensuing. The vertical and oblique cuts are more likely to leave a noticeable cicatrix than the horizontal, which are hidden by the natural loose folds of the skin. A wound of the upper lid may cause ptosis by injuring some of the fibres of the levator palpebrae

The deeper wounds may injure the tarsal cartilage and cause a permanent distortion which materially interferes with the function of the lid. In still deeper wounds the eye itself may be pierced, and if there is much spasm of the orbicularis it may be difficult to open the lids, and thus the more serious part of the injury is occasionally overlooked.

Marginal wounds, unless the edges are brought together most perfectly, may produce a persistent coloboma, and even with the most perfect surgery a trichiasis cannot always be avoided. A perforation of the lid sometimes causes a symblepharon, and therefore a prognosis should be delayed until that danger is passed. If the tarsal cartilage has been involved in the accident, some deformity almost always remains, and less deep wounds, when they heal by granulation, are frequent causes of permanent distortion.

Burns of the Lids

occur comparatively frequently in workmen engaged in the manufacture of acids and alkalies, and they are apt to be more troublesome in the healing than incised wounds, although they are less likely to be septic. In forming a prognosis

we have to consider the depth of the wound as well as its extent. For if deep, there is sure to be contraction, and if it is sufficiently near to the lid-margins, an ectropion will almost certainly ensue. If on the other hand the burn is superficial, and more especially if it is not near the margins, it is probable that no permanent mischief will follow.

Traumatic displacement or obliteration of the punctum and canaliculus is a frequent source of epiphora and materially interferes with work. An injury of the palpebral ligament may also interfere with the due function of the lachrymal apparatus.

Emphysema of the lids is an accident that may occur even without any fracture of the orbit or rupture of the periosteum, and is then more uncomfortable for the patient than alarming to the surgeon. But more usually it is an accompaniment of a traumatic communication between the orbital or palpebral cellular tissue and the frontal sinus, the antrum, the nose or the ethmoidal cells. In such cases it is the original injury, and not the resulting emphysema, that has to be considered in forecasting the future. Considered by itself the prognosis of emphysema is always good.

Erysipelas

is an occasional accompaniment of injuries of the lids, but less frequently so than in pre-Listerian days. The superficial form usually subsides without any permanent mischief being caused, but the phlegmonous form is often a most serious disease. In addition to its own disagreeable effects erysipelas may be the cause of optic atrophy, either from pressure on the central vessels, as Knapp believes, or from erysipelatous inflammation spreading along the sheaths of the vessels and affecting the retina and nerve directly. Or again an erysipelas of the face may set up phlebitis of the ophthalmic veins, followed by thrombosis of the cavernous sinus and death. Fortunately this complication is rare, but in all cases of severe erysipelas involving the orbit the prognosis is bad, for a large percentage of the patients who do not die become blind in one or both eyes. Phlegmon of the orbit may cause prolonged suppuration with inflammation of Tenon's capsule, or ectropion may follow from sloughing, either within or without the orbit. Matting of the tissues may permanently fix the eye by interfering with the action of the muscles, or, later on, contractions may cause a very disagreeable ectropion.

A traumatic phlegmon of the lids, if situated at the inner angle, may be mistaken for an inflammation of the lachrymal sac that is not due to an accident, and therefore a careful differentiation is called for. Dacrocystitis is not an uncommon sequela of erysipelas of the lids, and keratitis sometimes occurs.

Ptosis

may be produced by an injury to the levator palpebrae, and, if unremedied, it is a very serious disability to the workman. An early operation is likely to be successful in reattaching the torn strands of the muscle, but if delayed, there is less chance of a satisfactory result. If the ptosis is double, complaint is made of the difficulty in going up a ladder. Fortunately double traumatic ptosis is rare ; but even when single few employers would risk the responsibility of engaging a workman so affected.

Another form of ptosis is that which is caused by an injury of the sympathetic nerve, and it is usually associated with miosis and diminished tension of the eye. The ptosis is generally slight and does not tend to increase, nor is it likely to interfere with a man's capacity for work. Ptosis may also be caused by an injury of the branch

of the motor ocli which supplies the levator palpebrae. Still more rarely a ptosis may result from an injury of the head which has affected the cortical centre of the third nerve.

Double traumatic ptosis on rare occasions is caused by periostitis of both orbits. The prognosis of paralytic ptosis, if it is the only lesion, is good ; the modern operations being most satisfactory.

Ptosis may occur from a blow with a blunt instrument, such as may result from striking the lid against a stake in the ground when stooping. Probably the ptosis in such a case is due to a haemorrhage into the muscle sheath. Complete recovery in about a fortnight is the usual result.

Ankyloblepharon and Symblepharon.

Injuries involving the palpebral margins of the canthi are a very frequent source of a troublesome progressive adhesion of the edges of the lids (ankyloblepharon), and in spite of treatment it may be months before the full extent of the damage declares itself and before an attempt can be made to remedy it. Simple as the operation may appear it is wise not to be too positive in promising success, especially when the case is complicated, as it often is, by adhesions of the lids to the eyeball (symble-

pharon). If the lids are adherent quite up to the canthus, mere division is likely to be followed by a recurrence of the ankyloblepharon; but if the lids are only connected by a bridge of tissue, a successful issue is to be expected. Consequently in giving a prognosis in symblepharon it should be noted whether the attachments are merely tendinous cords, when a good hope may be expressed, or whether there is an agglutinous adhesion of palpebral surface to ocular requiring considerable dissection, when a less hopeful result is to be expected from an operation.

The commonest cause of ankyloblepharon and symblepharon in workmen is a burn, either by molten metals, or by sparks from a furnace or by the use of chemicals, but in medico-legal cases it must not be overlooked that a very similar condition may be produced by severe forms of conjunctivitis, especially diphtheritic. In rare cases they are congenital.

Entropion and Ectropion.

Inversion and eversion of the lids may result from injuries and, like symblepharon and ankyloblepharon, they cannot be dealt with operatively

until the primary wound has healed. The hideous deformity which is sometimes produced by a severe ectropion is likely to interfere with a man's chance of obtaining work, not only in consequence of the deformity it presents, but also by the interference with sight. Whilst ectropion exposes the eye to the invasion of dust and bacteria the opposite condition of entropion causes equal harm to the cornea by the constant irritation of the eyelashes. In both cases operation should not be delayed longer than is necessary for the eye to become quiet after the general effects of the accident. At the same time, however, it is necessary to wait for the cause of the ectropion or entropion to subside before resorting to operation, for it may happen that with the subsidence of the cause the effect may cease. No surgeon wants to do an unnecessary operation, more especially when the result may convert a temporary entropion into a permanent ectropion, or a passing ectropion into a fixed entropion. Fortunately in mild, and often even in very severe cases, both of ectropion and entropion, a good prognosis can be given. Entropion and ectropion may arise from other causes than traumatism, and in doubtful cases strict inquiry should be made as to whether there had been any

peculiarity in the lids, or any lachrymation, before the accident.

It sometimes happens that a man engaged in a cloth factory, for instance, from the constant irritation of the particles of wool develops a chronic irritability of the conjunctiva and eventually an entropion, and then the difficulty referred to before arises as to whether it is a traumatic, or an industrial, disease. It is probable that a man in such a condition seeking a situation will in future find the door of every factory closed to him, and that his life's occupation is gone.

In senile people, the eye suffering from an ectropion said to be traumatic should be compared with the uninjured organ, especial note being made as to whether there is any slight outward displacement of the punctum in the sound eye. Cases of difficulty are those in which this happens, for it is often impossible to say whether a slight tendency to senile ectropion has been accentuated by the accident or whether the double senile ectropion has always been more advanced in one eye than in the other. Such cases are, however, not very numerous, and do not often lead to any questions as to ability to work.

Traumatic Lagophthalmos

is produced—(1) By burns and wounds of the skin and deeper structures of the lids, the resulting cicatricial contraction preventing them from closing over the globe; (2) by ectropion and entropion, which are often due to the same causes; (3) by traumatic proptosis, when the fault is not in the lids but is the result of the forward propulsion of the eye; (4) by paralysis of the orbicularis palpebrarum, when the lower lid cannot be raised to meet the upper, as a sequel of paralysis or paresis of the facial nerve. From its irregular course this nerve is very liable to be injured. In a case recorded by Noyes a mason injured his facial nerve by falling on his trowel, which cut the nerve between the angle of the jaw and the mastoid process. When seen sixteen years later partial recovery had taken place. The facial nerve may also be damaged in fracture of the base of the skull, and also in cuts of the face.

In considering the prognosis of lagophthalmos due weight must be given to the possibility of curing the condition, for if it is incurable, there is great risk that the eye will be lost from the constant irritation of dust, which is liable to set up a chronic

conjunctivitis and keratitis. The part of the conjunctiva which suffers is a horizontal band below the cornea. In cases of conjunctivitis which are said to be due to traumatism, if the inflammation is limited to that area, a careful examination should be made to find out whether a paralytic form of lagophthalmos, which is not traumatic, may be the cause of the conjunctivitis.

In many cases of lagophthalmos something can be done by blepharoplasty. The injured facial nerve may improve with time, and its ends may re-unite, but much patience and perseverance will be required in always keeping the eyes closed at night by a bandage, and by wearing protecting glasses or shade by day. If the fifth nerve is also involved the risks from dust and especially of neuroparalytic keratitis will be much intensified, and such a case demands a serious prognosis. The epiphora that is associated with paralysis of the orbicularis, due to displacement of the punctum, is sometimes sufficient to interfere with a man's daily work.

Penetrating Wounds of the Orbit

are frequently caused by pieces of metal, by the bursting of bottles and also in many other ways.

They may be deep, the foreign body passing through the lid or between the orbital wall and the globe, to be lodged near the sphenoidal fissure. The track may appear to pass through the eye itself, whereas careful examination will show that the foreign body has been deflected by the tough sclera in a circular course to the apex of the orbit. Or an apparently devious course may be produced by the eye having been struck when the man was looking obliquely. In probing such a wound there are two points which the surgeon should remember : (1) To ask the patient to turn his eye to the position in which it probably was when the injury was produced ; and (2) that an imaginary straight line from the point whence the foreign body came to the wound will give the direction in which the probe should be held in passing it in. If the optic nerve has been struck blindness may be produced immediately in the eye, or it may come on gradually. A large number of wounds produced in this way by hot metal are aseptic, healing readily and causing no trouble, but splinters of wood on the other hand more often lead to prolonged suppuration. If the course of the foreign body is through the lid, a depressed cicatrix may result, the movement of the tarsus may be inter-

fered with, and the eye finally lost from corneal exposure and irritation. It is a remarkable fact with regard to foreign bodies in the orbit that even when of large size they are frequently overlooked. In the well-known case of Mr. Brudenell Carter's a piece of iron hat-peg, more than $3\frac{1}{4}$ inches long, remaining unsuspected in a man's orbit for a week. Some time ago I saw a man who had been struck by his fellow-workman on the left eye. The case came before the magistrates and a small fine was inflicted on the assailant for what was called a black eye. A week later the injured man came to the Eye Infirmary with intense chemosis. Chemosis suggested a foreign body, and, on probing, a piece of the stem of a clay pipe was found imbedded between the globe and the floor of the orbit. If the optic nerve has been divided or otherwise injured sufficiently close to the optic papilla to cut the central nerve vessels, the fundus is said to display the customary appearance of embolism of the central artery.

A small aseptic foreign body far back in the orbit is usually best left alone, and if the wound heals painlessly, there is fair expectation that it will not give future trouble. But if a deep wound has been caused by a larger object, serious injury

may result from direct damage to the blood-vessels, the motor nerves and the muscles. All the orbital nerves (II, III, IV, VI, and VII) may be affected in deep orbital wounds, such as may be caused by a knife, etc.

In cases where the lachrymal gland has been destroyed very little evil may result from its loss of function, the lubrication of the eye being undertaken by Krause's glands, and the man may return to his work with unimpaired sight. It is usually a less serious accident than one which involves either the lachrymal sac or the nasal duct.

It frequently happens that although the globe has not been touched by the foreign body in piercing the orbit, yet considerable damage is done to the internal parts of the eye by haemorrhage or inflammation. In case of gunshot injuries of the orbit or adjoining parts vibration injuries, as they have been aptly termed, may cause a ruptured choroid or a detachment of the retina, either of which may be hidden by an extensive vitreous haemorrhage, whilst later on a plastic choroidoretinitis may gradually destroy the function of the eye.

Direct injuries to the nerves sometimes happen and a paralysis of the muscles they supply ensues. Ptosis is frequently the result of such a lesion.

CHAPTER IV

Injuries of the Eyeball—Injuries of the Sclera—Rupture of Sclera—Dislocation of Eyeball—Wounds of Cornea—Abscess of Cornea—Hypopion—Rupture of Cornea—Burns of Cornea and Injuries from Chemicals—Neuro-paralytic Keratitis.

Injuries of the Sclera from Foreign Bodies.

Wounds of the sclerotic from foreign bodies may be conveniently divided into three classes, according to their depth, which to some extent influences the prognosis: (1) superficial wounds; (2) penetrating wounds; (3) perforating wounds. The distinction between these three classes may be summed up in the difference between the words "on," "in" and "through." A foreign body that has lodged on the surface has not penetrated the sclera, and one which has penetrated into the fibrous tunic of the sclerotic, unless it has also passed through the lamina fusca into the choroid, has not perforated. The words penetration and perforation are sometimes used interchangeably leading to obscurity and uncertainty. A foreign body that has gone

through the sclera into the eye has perforated the sclera, and perhaps penetrated the vitreous, and if it has gone through the eye into the orbit, it has perforated the eyeball.

Foreign bodies lodged superficially in the sclerotic are usually not very painful, and can be removed without trouble; but if they are embedded in the sclera and do not interfere with work or cause any discomfort, as is often the case with grains of powder and other aseptic substances, they may be left there permanently. The force of the impact may cause injuries to other parts of the eye, but otherwise scleral injuries by the lodgment of foreign bodies usually terminate favourably. An exception, however, must be made in the case of a foreign body which has penetrated sufficiently deeply to weaken the resistance of the sclera to the intra-ocular tension. When this happens a staphyloma may gradually ensue and a choroidal hernia. As this is one of the late results, its possibility must always be considered in giving a prognosis in deep wounds of the sclerotic.

Rupture of the Sclera.

A blow on the eye may produce a rupture of the sclerotic, the usual site being upwards and inwards,

from contre coup. The explanation of this being the usual site lies in the fact that it is the situation opposite to the most exposed part of the globe, that is downwards and outwards. The rupture is generally a few millimetres from the cornea, which it partly surrounds in a concentric manner, but the cornea itself, owing to its elasticity, almost invariably escapes. These injuries are naturally very severe ones, and out of the rupture may be extruded the lens, the iris, the ciliary body, the vitreous, or the retina and choroid. Whether one or all in the majority of cases the prognosis is bad ; but yet when there is no rupture of the conjunctiva, as quite frequently happens, it is remarkable how well some really serious ruptures do. Nevertheless, the scar is likely to be a very disfiguring one, and in considering the prognosis in the case of an injury to the external parts of the eye of a workman it is important to bear in mind that the prognosis is not a question of vision only, but also of the appearance of the eye. Any deficiency in this respect is likely to be detrimental to the man in getting employment.

The rupture occurs from within outwards, and therefore is not complicated by the direct infection of a septic foreign body ; and, moreover, in consequence of the looseness of the conjunctiva there is

frequently no lesion of that protective membrane. The edges of the rupture are thus kept together, and no germs from without can be introduced. As a general rule, if the conjunctiva is not wounded, there is no immediate necessity to enucleate, but it may very well be left to see what reaction takes place, with a view to saving the eye if possible. But if the conjunctiva has been ruptured, or more especially if it has been pierced by a foreign body which is probably septic, it is more usually the proper course to enucleate or eviscerate at once. But supposing all go well, the patient must not expect to escape unscathed. He may keep his eye, but it is probably a damaged one, and one in which mischief may be lighted up afresh months or years later. External squint, irido-cyclitis, ossified choroid. phthisis bulbi, sooner or later may come on, necessitating operation. Should the rupture occur in the neighbourhood of the ciliary body, as it so frequently does, or should it be at the corneo-scleral margin with prolapse of the iris, which shows signs of the formation of a cystoid cicatrix, the horrors of sympathetic disease immediately present themselves to the mind of the surgeon. Leaving out of the question all feelings of humanity, it is an unpleasant experience for the employer to have to

recompense a workman for the loss of an eye which has been destroyed in his service; it is also a serious matter for the employed to be entirely deprived of the use of one eye: but the double disaster of the loss of both eyes, whilst it is a hideous nightmare to the employer, is to the sufferer, who feels his life in every limb, the ghastliest lifelong catastrophe that this world can produce. Occasionally the rupture of the globe is in the neighbourhood of the optic nerve, a condition which may be recognized by the very marked and immediate reduction of the tension of the eye; there may be also at the same time some consequent wrinkling of the cornea. In prognosis these cases have the advantage of being further away from the ciliary body.

But with regard to minus tension we must be on our guard not to attribute every case to rupture, for it is well recognized that in many vibration injuries of the orbit in which no rupture has occurred the tension of the globe for the time being is reduced, and in some cases this loss of tone remains permanently.

Ruptures of the sclera are often the cause of a loss of vitreous, and if the immediate injury is not sufficient to destroy sight, the subsequent slower train of symptoms will render a favourable prog-

nosis impossible. Due regard to the quantity of vitreous which has escaped must be given, for whilst a small amount may be comparatively harmless, a large amount almost invariably means, if not ruin, at least serious damage to the eye.

If the rupture of the sclera is not complicated by a rent in the overlying conjunctiva, and if it is not associated with a prolapse of the internal parts, the prognosis is favourable and the eye may heal perfectly. With a large escape of vitreous a case may do well for a time, but later on a detachment of the retina may follow with total loss of sight.

Dislocations of the Eyeball

may be divided into two classes: (1) Those that are accompanied by no rupture of the optic nerve or extrinsic muscles, but only by a stretching of those structures; and (2) those that are accompanied by rupture, known as avulsions. In the former case the eyeball is displaced in front of the lids which contract behind it in a manner suggestive of paraphymosis. The prognosis in these cases is very much better than it is in cases of avulsion, and if the dislocation is quickly reduced it may be that no untoward consequences will arise. Some-

times the general slackening of the parts predisposes the eye to future dislocations on very slight provocation ; and another, and a more serious, sequel is that the stretching of the nerve may be the starting-point of an optic atrophy, which may end in blindness of that eye. All such cases, therefore, should be watched carefully, and the field of vision should be frequently taken before a prognosis is ventured upon. A general loosening of the ocular tissues sometimes enables a man voluntarily to dislocate his eye without any injury ever having happened. It is conceivable that an unscrupulous person having the faculty might utilize it for the purpose of malingering. The entire absence of any sign of an injury would, however, at once distinguish it from a true traumatic luxation and expose the fraud. In cases of avulsion the prognosis is much more serious. There has been, it may be, a rupture of muscles, or it may be of the nerve, or it may be of both, and also there may be a rupture of the sclera. Such being the case, the treatment and prognosis are alike simple, the former is enucleation, the latter blindness.

Foreign Bodies in the Cornea.

Amongst the minor accidents to which workmen

are exposed, there are few more frequent than those which are caused by foreign bodies lodging in the cornea. In the large majority of cases they are fortunately of very little consequence, although the incapacity for work is usually immediate and complete. So common are they, especially among metal and stone workers, that in most factories and works there are men who, from prolonged experience, have become expert in their removal. Their surgery may be of the rough and ready order, yet in the large number of cases it is successful. But there is also a minority of cases which drift to the nearest ophthalmic institution. In the happy-go-lucky days, which are now fading into the past, the workman took the risk of any damage that might be done to his eye by the amateur surgery of his mate, and if an occasional cornea was perforated by clumsy methods, or if the wound became septic from the use of a penknife that had been carefully cleaned on his greasy sleeve, it was the luck of life and nobody's fault. The workman is born to accidents as the sparks fly upwards. But times change, and now capital and labour are partners, and that which is bad for the latter must be shared by the former. Accidents assume a greater importance, and their avoidance is necessary, not

only for the individual, but for the public weal. Capital shifts its responsibility by insurance, and labour gets its recompense for loss of producing power. A little extra cost, which doubtless eventually comes out of the consumer's pocket, and so the world goes round. Formerly with no responsibility on employer and no compensation for employed, the injured producer drifted on to the rates, and thus the consumer paid, and so the world went round.

But how are these minor accidents to be treated with present day views about sepsis and antiseptics? The frequency of their occurrence is the difficulty. The man will not constantly run to the doctor to have a small particle removed from his eye whilst the danger of having it removed by his mate is so infinitesimal, and therefore it is probable that the amateur surgeon will continue his operations. But there is no doubt that the number of accidents from particles in the eye could be enormously reduced by the enforced use of protectors. Workmen, however, will not wear them, and there is probably ground for their complaint that they may sometimes interfere with the efficiency of work. But so important is it that they should be worn, especially in metal grinding, that, for the benefit of

the employed, stricter regulations should be made, and no workman who, in consequence of his refusal to wear them, receives an injury should be entitled to compensation. Some reduction in the number of cases of sepsis might be obtained if in all factories where the amateur surgeon is tolerated rules were adopted with regard to cleanliness. An excellent plan, suggested by Mr. Snell, is that a spirit-lamp should be kept at hand and the spud passed through the flame before use. The only difficulty would be to get the workman to light the lamp. Possibly a more certain plan would be to keep the spuds in a bottle of solution of carbolic, lysol or other antiseptic, with instructions that the instrument is to be used wet after dipping it in a second bottle of boracic solution to wash off the irritating antiseptic.

The surgeon should make a rule of immediately examining a foreign body removed from the cornea or from other part of the eye, and if there is any doubt about its nature, it should be preserved for more minute examination. A simple way of preserving these small particles is to smear a little vaseline on the bottom of the inside of a pill-box, to which the body adheres, and the name of the patient can be written on the lid.

Not long ago a patient came to me saying that

he thought that he must have a piece of stone in his eye. He worked for a large Bath-stone company, and had stopped work a week previously in consequence of the discomfort in his eye, but he had not consulted his doctor. On examination a foreign body was seen near the corneal limbus with ulceration around it. The aqueous was muddy, the pupil was contracted, and there was hypopion. On removing the foreign body the microscope showed it to be the wing-case of a beetle. Eventually the man lost his eye. Had the microscope shown the foreign body to be a chip of oolite instead of a fragment of a coleopter, he would probably have received compensation.

It is surprising how little discomfort these foreign bodies give rise to when they have a smooth surface —such, for instance, as the husk of various species of grain—and they will sometimes remain in the cornea, especially if they are near the limbus, for months without arousing the suspicion of the patient. Particles of metal or stone, on the other hand, rub against the lid causing immediate discomfort, and it is only when they are aseptic and quite buried in the cornea that they are unirritating.

Wounds of the Cornea and Abscess.

An abrasion of the cornea, if slight, is sometimes difficult to see, and in order to throw it into relief the use of fluoresceïn has been introduced. A 2 per cent. solution with 3 per cent. of sodium bicarbonate is the usual strength, and if a drop is placed on the cornea any breach of surface is immediately stained green. If there is a wound of the conjunctiva a yellow discoloration will appear. For those not frequently requiring to use fluoresceïn it is convenient to keep it in the form of sterules.

A superficial wound of the cornea which, when stained by this agent, shows a large but shallow abrasion, is often very painful, but most usually it heals rapidly without leaving a cicatrix.

Keratitis Bullosa.

But on rare occasions attacks of keratalgia may recur again and again, for months or years, sufficiently severe to prevent work. Especially is this the case after blows or abrasions by blunt instruments, such as the finger nail, curling tongs, splinters of wood, etc. If these cases are very carefully examined with fluoresceïn it will be found that the corneal epithelium is detached. The pain is prob-

ably due to the tearing or stretching of the fine terminal ramifications of the corneal nerves. Generally the recurrences are first noticed by the patient when he wakes in the morning. He finds he cannot open the eye without pain and photophobia. An examination discovers a vesicle under the epithelium. The vesicle breaks, discharges its contents, and heals in a few days. The prognosis is unsatisfactory on account of the great liability to recurrences. There are intervals of apparently perfect convalescence, and then weeks later the man returns with the same complaint that the pain interferes with work.

Deeper wounds always leave a scar, which if near the centre of the cornea may interfere with sight. It is in great measure upon their depth that the prognosis in injuries of the cornea depends. If only the epithelial layer is affected, perfect resolution may be expected; but if there has been loss of Bowman's membrane, it will be replaced by connective tissue, and a permanent scar will certainly remain. Some slight improvement may take place as time goes on, but genuine corneal tissue is never renewed. Especially in senior workmen are scars permanent, but in young apprentices a rather more hopeful view can be taken.

It sometimes happens that a slight wound of the cornea in a man past middle life, whose general health is not very good, or who is a drinker, becomes a very serious matter. Signs of sepsis rapidly develop, and a hypopion ulcer destroys the eye.

Chronic dacrycystitis is a serious complication in cases of wound of the cornea, and the surgeon cannot be happy about the prognosis until healing has occurred. The wound on examination may be found to be small, it may be superficial, it may be healthy, and one may be tempted to give an optimistic opinion, but if there is dacryo-cystitis infection may follow and hypopion ulcer appear. The only foreign bodies lodged in the cornea which almost never give rise to suppuration are particles of lime, grains of gunpowder and small pieces of hot metal. But particles of coal, on the other hand, seem to have a much more disastrous effect, and in miners one often sees eyes unexpectedly destroyed in consequence of wounds, originally slight, which have been caused while mining.

A contusion of the eye by a blunt instrument, without causing either a cut or an abrasion of the cornea, will very frequently produce an abscess in its layers. The progress is likely to be slow, and in an unhealthy man it may be disastrous. But

the more common cause of abscess is a septic wound. Labourers in the cornfield are especially liable to it, the original infection being caused by a scratch by the beard of grain, and the probable introduction of some form of aspergillus. The prognosis in these cases is bad, especially in hot weather.

Hypopion is very likely to occur from abscess of the cornea or from septic injuries either of the cornea or of the adjacent parts. An ulcer of the cornea, even though it has not perforated, is a common cause of hypopion.

The prognosis of hypopion depends in the first place on the disease which has produced it, and secondly on the age and health of the patient. Given a sound constitution in a man in the prime of life, it is extraordinary in how few hours a large hypopion will sometimes disappear. But in a man past his meridian, who shows signs of atheroma, or who is the victim of heart or kidney disease, the prognosis is altogether different, and a favourable termination is not to be expected.

Rupture of the Cornea

is so exceedingly rare, if it occur at all, that it may be left out of consideration.

Burns.

Burns of the cornea caused by heat or by explosion and injuries produced by chemical escharotics, which are not strictly speaking burns, are apt to be deceptive. They are sometimes worse than they seem and occasionally seem worse than they are, and consequently an early prognosis should not be given. The dense white opacity which is frequently seen soon after the receipt of the injury is not a genuine leucoma but a necrosis of the cornea, and it may be thrown off as a slough, causing perforation panophthalmitis and septic absorption. Dryness of the opaque cornea with anaesthesia is a bad omen in these cases. Later on there is the danger of symblepharon to be reckoned with. Injuries from molten metal sometimes leave less permanent mischief than is expected because the immediate rush of tears cools the metal at the same time that it forms a film of steam between the eye and the foreign body, thus preventing absolute contact. In injuries by acids or alkalies the tears do good by diluting the escharotic, but in those caused by unslaked lime they do harm, the slaking of the lime producing heat. But whether the injury is produced by heat or escharotic, as in

similar injuries of the lids, it is not safe to give a satisfactory prognosis until the eye has become quiet and until it shows no sign of commencing staphyloma.

In cases of injury by explosion care should be taken to see whether the damage is confined to the obvious parts, as it frequently happens that a foreign body has been driven by the force of the explosion into the eye.

Traumatic Neuro-paralytic Keratitis.

On rare occasions the cornea may suffer from keratitis without any direct blow having been received, in consequence of a fractured orbit or base or a perforating wound which has injured the trigeminus or one of its ocular branches, especially the nasal. Winking and lachrymation do not take place and the anaesthesia allows particles of dust to set up a neuro-paralytic keratitis without any warning discomfort. The cornea becomes a prey to every wandering micro-organism and a dense leucoma is often the happiest issue that can be expected. Relatively the disease is a commoner sequel of injuries of the nerve trunk than it is of one which involves the nuclear region, and the keratitis does not develop until some time after the original

injury. When it is set up by a traumatic periostitis, it may be many months before it appears. A small number of cases do well, but the prolonged and constant attention which they require too often fails, and the prognosis is unfavourable in the majority of instances. The causation of th diseease is of great importance to the workman, as disputes are liable to occur from the difficulty that arises in the lay mind in understanding how an inflammation of the front part of the eye can be caused by a blow on a distant part of the head.

CHAPTER V

Iris : Iritis — Prolapse — Contusion — Foreign Bodies — Hyphaema—Irido-dialysis—Irideremia Mydriasis—Miosis — Iridoplegia — Cycloplegia — Retroversion —Implantation Cyst—Ciliary Body : Cyclitis—Foreign Bodies — Sympathetic Diseases : Irritation—Ophthalmia.

Injuries of the Iris.

A WOUND of the iris, caused by a perforation of the cornea, in which the lens has escaped injury, is not always such a severe accident as it at first appears to be, even though the outward rush of escaping aqueous has carried with it a prolapsed piece of the iris to be entangled in the torn edges of the cornea. If the wound is not a septic one and the protruding iris can be replaced or excised, healing will probably take place quickly, and in the latter case no more damage may result than that which follows an iridectomy each step of which has been done secundem artem. In such cases the workman will probably return to his work, with, for all practical purposes, unimpaired sight.

Traumatic Iritis

may be caused by contusions or by penetrating wounds; the former cause being infinitely less serious than the latter. The prognosis depends very much upon whether it is a septic or an aseptic iritis that we have to deal with, and the concussion form may be safely considered aseptic. Aseptic traumatic iritis is not very common, and clean wounds usually heal without any sign of it. The purulent form of iritis, though complicated by a large hypopion, is less to be feared than the plastic in which all chance of resolution is frequently prevented by adhesions and synechiae. But favourable results do not always occur, and in some the ciliary body becomes involved and eventually the prognosis will be complicated by the possibility of sympathetic ophthalmia.

A man suffering from traumatic iritis is not likely to be fit for work for three months after the onset, and in some chronic cases it may be for a much longer period. Even then he will be liable to relapses. In forming a judgment as to the probability of relapses much importance should be laid on the diathesis of the patient—syphilis or so-called rheumatic for instance—as it is a much more potent cause of recurrences than is the presence of synechiae.

But supposing there are no diathetic considerations to be reckoned with the prognosis depends upon three important questions which have to be asked in cases of penetrating injuries of the eyes : (1) Is there a foreign body in the eye ? (2) Is it septic ? If there is a foreign body, and it is aseptic, there is good hope that the reply will be favourable to a third question, Is the case one in which sympathetic ophthalmia is likely to follow ?

A severe traumatic iritis will almost always be accompanied by cyclitis, and there will be a good deal of plastic, or if it is septic, purulent exudation.

In traumatic iritis then we have certain definite factors to help us to formulate a general rule of prognosis, subject, nevertheless, to any particular circumstances of the case.

If the iritis is due to a concussion, without any injury to the lens or other parts, the prognosis is good. If it is due to a wound caused by an aseptic instrument without synechiae the prognosis is good, but if in such a case there is anterior synechia with dragging on the ciliary body it is not so good. If, however, the synechia can be relieved by iridectomy the prospect becomes brighter. If on the other hand the instrument was septic the outlook is bad. Should there be a foreign body remaining in the

eye, the prognosis depends on whether it can be removed and the nature of the foreign body. If it is placed on the iris, it can probably be taken away by forceps or by the use of the electro-magnet; but if it has perforated the iris and penetrated the vitreous, or fallen into the posterior chamber, the difficulty will be increased. If it is in one of these situations, and if it is composed of copper, the chemical process set up is likely to act disastrously, but if it is of glass or lead, the prognosis is very much less serious.

Foreign Bodies

may lodge in the iris, and here again the important question is connected with sepsis. But whether septic or not no prognosis is called for until an attempt to remove the foreign body, either with or without iridectomy, has been made, or until it is decided that the foreign body is causing no reaction and can be safely left. But the fact that it causes no reaction does not necessarily mean that it can be safely left. Its position, nature and numerous other considerations, as shown later, have to be taken into account.

Foreign bodies on the iris are not often met with, and when aseptic they have been known to remain

perfectly quiescent for many years. In an explosion grains of gunpowder sometimes pierce the eye and become entangled in the iris, setting up more irritation than might be anticipated. Their action is probably chemical.

It occasionally happens to a beginner that some difficulty arises as to whether a foreign body is in the iris or in the cornea. The point can always be cleared up immediately by a similar paralactic test to that used in locating opacities in the vitreous. While looking at the foreign body through the corneal loup the head is moved from side to side, when, if the foreign body is in the cornea, the iris will appear to move in a direction opposite to the movement of the head whilst the foreign body remains stationary, whereas if the foreign body is in the iris it will appear to move with it.

Of all injuries in which there is a foreign body within the eye the prognosis of those in which it is lodged in the iris are the most favourable, for an iridectomy will often be successful in removing it without any deterioration of sight.

Hyphaema.

Haemorrhage into the anterior chamber frequently accompanies various injuries of the iris.

If there is no iritis, in most cases the blood will become absorbed quickly and no permanent damage will result, but as long as hyphaema exists sight is apt to be very much interfered with. Recurrences, too, of the bleeding are not infrequent. Too optimistic a prognosis should not be given in the early stage of hyphaema, because there may be some other lesion existing which is masked by the effusion of blood. Irido-dialysis, for instance, is accompanied by hyphaema, as also may be a rupture of the choroid and detachment of the retina.

Besides iritis other injuries of the iris very often occur without any perforating wound. A blow on the eye may produce partial detachment from the ciliary body (irido-dialysis), or complete detachment (irideremia). Irideremia is a permanent lesion, and irido-dialysis almost invariably so also; but a fair amount of sight, especially in the latter condition, may be retained. In fact, a small irido-dialysis may produce no defect of sight at all, and years after the injury the eye may show no signs of secondary damage.

Some difficulty in working may arise from dazzling, and should this remain permanent, as is very likely, the workman has practically lost the use of an eye, and will be entitled to compensation if

he is consequently unable to earn the same wages as before the accident.

Occasionally irido-dialysis may interfere with work in consequence of mon-ocular diplopia. Generally speaking the larger the dialysis the more will it annoy, and, as is to be expected, multiple dialyses give rise to more dazzling than single ones.

In examining a case of irideremia it must not be forgotten that it may be congenital, in which case it is always an affection of both eyes, it is accompanied by nystagmus, and there are usually remains of pupillary membrane to be seen. The congenital condition, however, is not likely to be confused with the traumatic. The prognosis is serious, more so than in irido-dialysis, and good sight is hardly ever retained. There are, too, often other serious lesions accompanying it, and glaucoma may follow.

Traumatic Mydriasis (iridoplegia),

whether partial or complete, and paralysis of the accommodation (cycloplegia), are not usually recovered from, although the eye may remain a very useful auxiliary. Mydriasis may be due to an injury which acts as an irritant to the cervical sympathetic, but it is not very common. The pupil re-acts both to light and to accommodation, and the

dilation is not very marked. It is occasionally seen in cases of spinal meningitis after an injury. In compression of the brain mydriasis is very usually present, but concussion of the brain more often produces a sluggishness of the pupil without either dilatation or contraction. Mydriasis may also be caused by an injury which has produced paralysis of the third nerve, cycloplegia being often present, but the branch to the pupil may be the only one affected. Mydriasis may also be caused by an insensibility of the retina, or by an injury of the optic nerve causing atrophy, in which case the stimulus of light is no longer potent and consequently the physiological function of the iris ceases. A blow on the eye may produce it, and then the mydriasis is often, possibly always, due to a small radiating tear in the edge of the iris through the sphincter muscle. The condition is usually permanent, but slight degrees sometimes disappear. In these cases the pupil frequently does not contract to light, accommodation or eserine ; it may be quite circular, or, if there is partial paralysis, oval, the dilated portion corresponding to the seat of injury. The tension is frequently minus, although there may be little or no reduction of visual acuity.

Mydriasis may be due to atropine instilled to

aid malingering, or by another surgeon for ophthalmoscopic purposes. Lastly it may be, as is sometimes the case, a normal (?) condition of the iris, the cause of which is unknown and of no consequence. This occasional condition is to be remembered, as in case of an injury to the eye the surgeon, unaware of its previous existence, may give an unnecessarily serious prognosis.

The mydriasis which appears in thrombosis of the cavernous sinus requires a very serious prognosis.

In cases of monocular mydriasis patients may complain of the dazzling effect of the increased illumination on the dilated side ; but they can generally be assured that if the mydriasis remains permanent they will almost certainly cease to notice the dazzling.

Traumatic Miosis

may be due to an injury which has provoked direct irritation of the sphincter of the pupil, such as a foreign body in the iris, or even in the cornea ; or again, any irritation of the third or fifth nerve may produce it. It may be an early symptom of meningitis, when a serious prognosis is called for. A blow on the eye may be the cause, when it is often associated with minus tension. A paralysis of the sympathetic caused by a wound

in the neck will be recognized by the miosis being accompanied by slight ptosis, reduced tension, unilateral perspiration and capillary redness of the face. Miosis in this case is usually permanent; it is not likely in itself to interfere with the workman's labour, and may be distinguished from the tabetic form, which is generally bilateral, by the ptosis and occasional enophthalmos.

A man found insensible with miosis is more likely to be suffering from apoplexy than from an accident; but if the miosis is double, the possibility of opium poisoning must not be overlooked. The contracted pupils which respond to accommodation, and not to light (Argyll-Robertson), are likely to be spinal rather than traumatic in origin.

Retroversion of the Iris

is among the rarer injuries of the eye, and its replacement is not to be expected. A partial retroversion is of interest medico-legally from its resemblance to coloboma. A case which came before the author some time ago illustrates its importance. A farm labourer had been struck on the left eye by a stone thrown by his master's son, and an extensive subconjunctival haemorrhage was the result. He was attended

by his doctor, and in a week or two the ecchymosis became absorbed. He then claimed recompense from the farmer for impairment of sight, which he said had resulted from the injury. On examination the iris was seen to be notched downwards and slightly inwards, the pupil being somewhat pear-shaped, coming to an apex at the corneal limbus. The eye was quite quiet and with correction he could read 6/9. The sides of the notch were seen to be smooth and the pupillary sphincter could be traced down to the cornea. There was unmistakably no radiating laceration of the iris to be seen, and it was certainly not a traumatic coloboma. By oblique illumination the ciliary processes were quite visible. If he had had a retroversion of the iris, they would have been hidden behind its folds. On examining the right eye a coloboma was seen and vision was 6/12. The left eye, that is the injured one, had the better sight.

The peculiar appearance of the eye which had been struck had been observed by his neighbours from his childhood. I certified that I could find no evidence that his sight had suffered in any way from the accident, and the case was settled quite satisfactorily to the lawyers.

Retroflexion of the iris was observed in only

two cases of eye injury in the German army during the Franco-German war.

Another rare result of an injury to the iris, which, by coming on late, may alter the prognosis, is an implantation cyst, caused by a piece of epithelium or a hair (eyelash) being carried into the anterior chamber at the time of the accident. Unless the cyst is removed it will almost certainly destroy the eye by glaucoma or by cyclitis. But by early treatment the prognosis is good.

Traumatic Cyclitis

may be due to one or other of the following causes :—

i. Concussion without a wound.

ii. Injury to some adjacent part of the eye.

iii. A direct wound of the ciliary body.

The prognosis depends in great measure not only upon the cause we have to deal with, but also upon whether the form of cyclitis which supervenes is of the serous, the simple (plastic), or the purulent type. But in the majority of cases of traumatic cyclitis the question which overshadows all others is the one which deals with the possibility of the invasion of sympathetic disease.

Cyclitis may result from a contusion without perforation, and, if slight, may manifest itself merely

by a little lachrymation, slight ciliary injection and tenderness, without any hyphaema and with a mobile pupil. There is no probability of sympathetic disease developing in these cases, and the course, though it may be slow, is likely to run to a satisfactory conclusion. Severer contusions may be complicated with hypopion. Hypopion in other cases of concussion of the eye may be due to suppurative choroiditis when its absorption is less probable and the prognosis consequently more problematical.

As a general rule a cyclitis following a blow without perforation, even though complicated with hypopion, will probably subside without doing permanent harm.

But in severe cases of concussion it may happen that the ligamentum pectinatum is torn and the ciliary muscle split, causing a separation of the longitudinal from the circular fibres. The condition can sometimes be recognized by the consequent deepening of the anterior chamber. The prognosis is bad and the eye will probably be lost. In serous cyclitis very great damage may be done either by an increase of the intra-ocular tension or by the invasion of the vitreous by the fibrinous exudation. In the former case the results of glau-

coma will follow unless active treatment is adopted ; but even an iridectomy may not be successful in preventing the eye from becoming staphylomatous by slow degeneration.

In the simple plastic form of cyclitis the vitreous is very liable to be invaded, and the prognosis is worse than it is in the serous form. The yellow reflex one sees in the vitreous in this variety often precedes a phthisis bulbi. A large number of the cases end in a lost eye ; but, although the anatomical changes are more or less similar, the prognosis is not so bad as in the purulent type of cyclitis. Resolution may occur, but it is more common to get an occluded pupil or even panophthalmitis. In case of an occluded pupil an iridectomy, if it is performed after all symptoms have completely subsided, may give a certain amount of sight, but it is not safe to promise very much, as a rekindling of the cyclitis or of the irido-cyclitis may leave the eye worse, rather than better, than it was before. A knowledge gained from watching the progress of the disease from the beginning is of great value in estimating the probable success of operation. If the tension is diminished, the case is not hopeful, but if it is normal, or even increased, benefit may be derived ; and a careful examination of the

qualitative perception of light and the projection of the retina are valuable guides. In the purulent type of cyclitis, caused by a perforating wound in which the injury has been caused by a septic foreign body, or in which the wound has become septic afterwards, we have many serious considerations to deal with in forming a prognosis. Whether the original wound was in the ciliary body, or whether it has spread to it, the case is likely to be a prolonged and a most serious one. Apart from the danger of sympathetic ophthalmia, suppuration which rapidly becomes a panophthalmitis may ensue. An early enucleation, or preferably evisceration, may cut short the case, but one sometimes hesitates to recommend so severe a measure in the early stage.

Sometimes in cases of perforating wounds in the ciliary region contraction of the cicatrix may produce an acute or chronic irido-cyclitis lasting for a long time, with intervals of subsidence and periods of upheaval. A portion of the iris may prolapse and become incarcerated in the scar, and though the eye may be quiet, yet in giving a prognosis there must always be the reservation that either a cystoid cicatrix may form or a relapse of the cyclitis may occur, and so long must the dan-

ger of sympathetic ophthalmitis be reckoned with.

A dislocated or a broken lens may protract or prevent convalescence, or, worse still, at an early stage unmistakable signs of sepsis, a hazy cornea, a turbid aqueous, or a hypopion may be a premonition of worse to follow. Irritation of the other eye may raise the question of the possibility of the onset of sympathetic disease and hasten the obligation to end the case by enucleation.

No positive prognosis should be given in a case of traumatic cyclitis until the eye is quite quiet; or, if the injured eye has been removed, an absolutely favourable one should be witheld for at least a month; for removal, although it is an almost certain preventive, yet it occasionally happens that it is not sufficient to stop the onset of sympathetic ophthalmia. In such cases it has been suggested that the disease was started by an infection due to an inflammatory condition of the orbital tissue remaining after the eye had been excised.

Foreign Bodies in the Ciliary Body.

In direct injuries of the ciliary body, the prognosis depends in great measure (1) on whether a foreign

body remains in the eye; (2) if so, whether it is removable; and (3) whether the wound is a septic or an aseptic one. Foreign bodies may be easy, but they are frequently very difficult, to diagnose. They may be invisibly buried in the ciliary body, and the ophthalmoscope, even though the media may be clear is unable to detect them, and the aid of X Rays, sideroscope, or giant magnet may have to be requisitioned. The smaller foreign bodies are more likely to become encysted than the larger, and when this occurs the eye may become quiescent; but if it shows no disposition to become quiet, it is necessary to enucleate it in order to prevent sympathetic disease. Slight suppuration in the neighbourhood of the foreign body is often a good sign, as it may be a preliminary to the extrusion of the foreign body, but if the inflammation spreads and the vitreous becomes involved, we may anticipate panophthalmitis.

An encysted foreign body may remain quiet for years and then some slight injury, or even some deterioration of the general health, may be sufficient to light up the trouble afresh. It is in cases such as this that long after the original injury a sympathetic disease breaks out. The accident may be quite forgotten, and consequently the real

nature of the case may be overlooked, and a too optimistic prognosis may be given.

Haemorrhage into the ciliary body occasionally leaves a permanent astigmatism which may interfere considerably with work.

Sympathetic Diseases

are rare diseases, and it is probable that they are rarer than they were before the introduction of antiseptic precautions in the treatment of wounds of the eyes. This does not necessarily mean that they are produced by bacterial infection travelling from the exciting to the sympathizing eye. For if by any means a primary wound can be made to heal more quickly, and more perfectly, it is quite conceivable, and to be expected, that any sequelae of it, no matter how produced, will be less liable to occur, or if they do occur, less likely to be so serious, than they would be if the wound healed more slowly and less satisfactorily, and was therefore for a longer time a source of irritation and danger.

Sympathetic diseases may be divided into sympathetic irritation and sympathetic ophthalmia, and the consideration of the possibility of their onset is one of the most serious questions which presents itself to the surgeon in forming a prognosis

in the case of any wound in which either the ciliary body is directly, or in which it may become secondarily, affected. The prognosis of any penetrating ciliary wound cannot be a confident one, and it cannot be a satisfactory one, as long as there is the ultimate possibility of sympathetic disease.

Sympathetic Irritation.

The division of sympathetic diseases into two classes seems to be justified by clinical experience and by pathological investigation. Sympathetic irritation is a neurosis, and its symptoms are those which are usually associated with neurosis : functional fatigue, vaso-motor disturbances, increased lachrymation, photophobia, concentric limitation of the field of vision, and so on. It is a recurrent disease which may come on again and again, year after year, but there are no inflammatory symptoms. Directly there is uveitis or deposits on the posterior surface of the cornea of the sympathizing eye, we have another disease to deal with, a disease which does not recur but which marches unfalteringly along different lines to a different goal. It is rare indeed for sympathetic ophthalmia to leave the eye no worse than it found it : sympathetic irritation invariably does. Sympathetic ophthalmia is

probably conveyed by bacterial infection ; it is most improbable that sympathetic irritation is. Sympathetic irritation does not tell us that sympathetic ophthalmia has arrived, but rather it is the pilot fish which precedes the shark, warning us that the latter is hovering, cautioning us that he is preparing to attack. Sympathetic irritation may occur without sympathetic ophthalmia, and sympathetic ophthalmia without sympathetic irritation, and the latter may recur with tidal regularity, exhibiting the same symptoms each time but not overstepping the dividing line, and then returning to the status quo. At last, without appreciable reason, the beaten path is forsaken, the uveal tract is substituted, and the malignant form of the disease discloses itself with all its fatal force and dire disaster.

Any eye which is blind from some traumatic cause if it is irritable or painful should be removed, even though there are no signs of irritation in the other ; and any blind eye which is not irritable or painful should be removed if there are signs of irritation in the other. A seeing eye which has been injured in the " dangerous " zone, that is within a zone $\frac{1}{4}$ of an inch wide, surrounding the cornea, no matter how good its sight may be, if there

be recurrent attacks of irritation in the other, must be sacrificed ; for no patient has any justification for retaining an eye the subject of traumatic cyclitis if he frequently gets such functional symptoms as mistiness of sight in the good eye, an accommodation which soon becomes tired, epiphora, or photophobia. If in addition he has tenderness over the ciliary region of the good eye there is no time to be lost. All patients who from the nature of their injuries are likely to develop sympathetic irritation should have the field of vision examined at least once a week, more especially if they are ignorant or unobservant people.

Sympathetic Ophthalmia

may be said to be present as soon as, but not before, there are signs of uveitis in the sympathizing eye. It is a disease of such serious import that in all cases of suspicion, if the disease has not actually begun, the exciting eye, whether a seeing one or not, should be sacrificed ; but if the disease has actually begun the exciter should only be removed if it is blind. It is a disease which possibly to some extent may be influenced by occupation, or mental considerations connected with it. Civil employment when compared with military appears to be some safe-

guard against its onset. It would seem as though the horrors of war had a malign influence in producing sympathetic disease, for the experience of surgeons engaged both in the American rebellion and in the Franco-German war coincides as to its great prevalence. The wounds, however, were almost entirely perforating ones.

Sympathetic ophthalmia may be divided into at least two classes, and the prognosis depends to no small extent upon the class to which the case belongs :—

i. Serous.

ii. Plastic.

iii. (doubtful) Papillo-retinitis without any uveal disease. This form is not recognized by some authorities, and, if it exists, is a mild form which does not tend to relapse, and which is cured by enucleating the exciting eye. Possibly it may be an exaggerated form of sympathetic irritation.

Sympathetic Serous Iritis

is a very much less serious form of the disease than the plastic, and usually it justifies a rather better prognosis. But it must not be forgotten that at any time the serous iritis may give way to a plastic, when the prognosis at once becomes most grave.

No reason can be given for this change of character, but that it does occur there is no reason to doubt. Mauthner believes that if the exciting eye is removed when serous iritis is present in the sympathizer the operation will cause the serous to become a plastic iritis, but the majority of authorities disagree with this view and consider it not only justifiable, but often incumbent, to operate in such a case.

The patient suffering from the serous form should be cheered up as much as possible, for there seems little doubt that depression has a very unfavourable action on the progress of sympathetic ophthalmia. He should be told that he has the mildest form of the disease, and that there is fair hope that some sight may be retained in one or both eyes. It is impossible to say in what cases of injury sympathetic ophthalmia is likely to appear, but there are some general rules that will help us to form a probable estimate. It is more likely to occur in septic than in aseptic injuries ; but the size of the wound and whether it is a lacerated or a simple punctured wound seem to have but little significance. Wounds of the ciliary body are the most frequent source of its occurrence, and the further away from that organ the injury is, and the less probability there is of its being secondarily affected, the more hopeful

is it that the overwhelming debacle of sympathetic ophthalmia may not happen.

It is doubtful whether sympathetic disease ever follows without an external wound at some period of the history of the damaged eye, but it is unfortunate that this point has not yet been absolutely cleared up. If an external wound is requisite for its production, it is a strong point in favour of the disease being septic, and that some form of germ infection is transmitted from the exciting to the sympathizing eye. Certainly a most favourable opinion may be given against the appearance of sympathetic ophthalmia in cases in which there is no external wound. Equally rare, or equally non-existent, is the sympathetic ophthalmia which is caused by chemical irritation. Some authorities believe that mere pressure of a tumour, or of a dislocated lens, on the ciliary body is sufficient to produce it, or again that the dragging of an incarcerated iris or of a symblepharon, may cause it. But all are agreed that glaucoma does not cause sympathetic disease, and yet the increased tension, one would think, must exert pressure on the ciliary body.

The surgeon is often placed in a most anxious position with regard to prognosis in cases of injury

of the ciliary body. He does not want to advise the patient to give up an eye unnecessarily on the one hand, whilst on the other he does not want to risk the onset of sympathetic disease. In our far-flung Empire it is not always possible for him to get the help of one who has had considerable experience, and who is willing to share the responsibility, and in all cases of uncertainty the bias of the surgeon should be in favour of operation.

If, when the surgeon has advised operation, the patient refuse to give up the eye, it is advisable to ask him to sign a paper saying he accepts all responsibility for not taking the advice. There is a double advantage in insisting upon this, for in the first place it impresses the patient with the serious view which the surgeon takes of his condition, and so may turn the scale in favour of accepting operation, and in the second place the document is indisputable evidence that the risk of retaining the eye was put before the patient. In order to help the practitioner the following general suggestions are somewhat dogmatically given; but the intuition which is the result of experience will sometimes justify a modification of them. The eye of a patient who has received a wound in the ciliary region should always be removed if the accident is one

which is certain to result in a blind eye ; but if the eye is not quite blind, and the symptoms are not very urgent, it may be retained for a few days for further examination and consideration. It sometimes happens that immediate blindness is caused by effusion of blood into the vitreous or into the anterior chamber, and then sight may return with its absorption.

An eye wounded in the ciliary region should be removed if the patient resides in a district so remote that skilled supervision extending over some months is impossible. The eye should generally be excised in a case of severe cyclitis which is complicated by an unremovable foreign body ; and it should be removed without any delay if an operation for the extraction of the foreign body has been unsuccessful. If sympathetic ophthalmia has begun, the exciting eye should be excised if it is blind, but it should not be excised if it is not blind, even though the amount of sight is small. Sympathetic disease does not usually break out under three weeks from the time of the accident, and it is seldom that it appears later than four months ; but once begun it is rare for it to end in recovery : much more likely is it that the end will be phthisis bulbi. If any glimmer of light remain after this most insidious

disease has done its worst, this increment, which we were not justified in promising, is so much off the dire disaster which overwhelms the patient. It seems doubtful whether age has any place in the etiology of sympathetic ophthalmia, for although some have thought that the young are less liable to it than the more advanced in life, yet, if there be any difference it is too slight to be of any value in prognosis. There is a better chance of saving a sympathizing eye if the cyclitis in the exciter is subsiding at the time of the outbreak; and there is a still better chance if the exudation in the second eye is of the serous and not of the plastic type. The prognosis is worse as far as the final result to the sympathizing eye is concerned when the symptoms set in with great violence from the beginning; but if, on the other hand, the initiatory symptoms are mild, there is hope that the course of the disease will also be mild. A sympathetic ophthalmia which does not come on until after the excision of the injured eye is likely to run a comparatively mild course. The prognosis is better, if an enucleation has to be done, if the eye is not intensely inflamed at the time of the operation; and whenever it is safe to do so it is best to postpone the removal of an eye until the acute symptoms have subsided.

In cases in which a sympathetic ophthalmia has subsided, leaving some vision, a favourable opinion should not be given for twelve months, and during that time the workman should not be allowed to return to work.

CHAPTER VI

Injuries of the Lens : Dislocation—Foreign Bodies—Iridodonesis—Traumatic Cataract—Injuries of the Vitreous : Hyalitis—Foreign Bodies—Loss of Vitreous—Haemorrhage—Detachment.

INJURIES OF THE LENS.

Traumatic Dislocations of the Lens

may be partial (subluxation) or complete (luxation).

Any subluxation is a constant menace to the function of the eye, and in the early days after the accident a decidedly favourable prognosis can never be given. Even if for a time there is little or no reaction, and if the iris is only slightly tremulous, yet the loss of accommodation which results will be a serious disability for the man who earns his bread by the sweat of his brow ; whilst the myopic astigmatism caused by looking through a tilted lens, or the hypermetropia caused by looking through the part of the pupil where there is no lens, will still further interfere with the function of the eye. Or it may be that a troublesome mon-ocular

diplopia impels the man to cover the injured eye when he works. Sooner or later other trouble will probably develop, and although the lens itself never becomes inflamed, it is frequently, in consequence of the pressure it exerts when swollen, a source of inflammation to neighbouring parts. At any time signs of cyclitis or glaucoma may necessitate surgical interference. A swollen lens or a fragment of lens matter in the anterior chamber is generally followed by iritis.

More rarely with prolonged rest a subluxation that is sufficiently marked to produce metamorphopsia may become replaced and normal sight may return, but it is more common for the subluxation to be permanent and for it to be the cause of astigmatism. Subluxations should usually be left alone unless they give rise to serious symptoms.

Complete luxations of the lens may be into the vitreous, or anterior chamber, or Tenon's capsule, or subconjunctival, or the lens may be extruded from the eye altogether. In any case it is a most serious injury, and still more so if it is caused by a perforating wound.

When the dislocation is into the vitreous, the condition resembles that which in olden days was intentionally produced as the recognized treatment

of cataract. If there has been no rupture of the capsule, the lens may remain in the vitreous unabsorbed and harmless for years, although for the man who is engaged in laborious work it is always a source of anxiety. In cases of doubt about the accident it must not be overlooked that ectopia of the lens is sometimes congenital, and therefore a malingerer, aware of his defect, may be trying to make capital out of it. Strict inquiry into the nature of the accident should be made and evidence pointing to congenital deformity should be sought. The other eye should be examined for a corresponding displacement as well as for a coloboma of the lens, iris, choroid and optic disc. The commonest site for an ectopia, whether acquired or congenital, is upwards or upwards and inwards, and if congenital, it is usually symmetrical. But the fact of the condition being present in both eyes is not proof positive that it is congenital, for a blow on the back of the head will sometimes displace both lenses, or it may be that one lens is displaced congenitally and the other traumatically.

The mon-ocular diplopia which on rare occasions occurs in concussion of the spine is probably due to concussion of the lens, though it may be of a hysterical nature.

If the capsule is ruptured, a slow process of absorption may proceed, but absorption by the vitreous is tedious, and the swelling and irritation of the lens may precipitate glaucoma. As a rule luxations and subluxations should be left alone as long as they give rise to no irritation, but as soon as this happens, or if the tension increases, an attempt to remove the lens must be made. The patient must be warned that in these operations the successes are few and the failures many, but until an attempt has been made no prognosis can be hazarded. The future prospects of any case where loss of vitreous is almost a certainty are rendered still more serious by the possibility of the lens sinking backwards towards the fundus oculi. It should therefore be the rule in cases of traumatic dislocation into the vitreous not to attempt to remove the lens as long as it is giving rise to no serious symptoms. But the supervention of glaucoma, of choroiditis or of cyclitis will necessitate more active measures. Dislocation into the vitreous, too, is often accompanied by a good deal of haemorrhage and plastic inflammation, and then it is liable to be followed by a shrinking of the eyeball. If the lens is in front of the vitreous, it is also usually best to remove it as soon as symptoms of irritation begin.

Dislocations into the Anterior Chamber

require operation before glaucomatous symptoms set in, and before the lens becomes adherent to the cornea, a condition which interferes with a decidedly favourable prognosis such as can generally be given in these cases. There is, however, one redeeming point in a lens adherent to the cornea, and that is that it is not liable to fall back into the vitreous when the patient is recumbent.

If the lens is displaced into Tenon's capsule the eye is usually lost, but a more hopeful prognosis is justified if it is subconjunctival. It can then be easily removed, and the eye will do well unless the rupture of the sclera and any other injury that the eye may have sustained prevent convalescence. If the lens is extruded altogether from the eye the prognosis is most serious, for force that is sufficient to cause such a catastrophe will most certainly damage extensively other parts. On rare occasions, however, eyes so injured have been known to retain sight.

Injuries of the Lens

may be caused by a blow with a blunt instrument, not necessarily on the eye itself, or they may be the result of a perforation of the cornea or of the

sclerotic and lens, either by a sharp instrument, such as a fork or a needle, or by a foreign body flying with sufficient impetus to pierce the eye. Such injuries may also rupture the zonule of Zinn, and months later they may be followed by cataract.

Injuries of the lens by foreign bodies have dangers additional to those which are caused by concussion. The foreign body, if aseptic, may remain lodged within the eye and cause sufficient mischief to destroy the sight, or, if septic, may very quickly pervert the organ into a mere bag of pus. Foreign bodies which have perforated the cornea, or rarely the sclerotic, may lodge on the anterior capsule of the lens, or they may penetrate and remain in its substance, or they may perforate it, passing on into the vitreous. In any case they usually produce a cataractous condition which may remain local or become general later on. Foreign bodies rarely lodge in the lens capsule, but if they do, apart from the small local opacity, they often give rise to no trouble. It is not unusual for a lens having a foreign body lodged in its substance to show signs of commencing absorption. In such a case an early operation to remove the crystalline should be done in order to prevent the foreign body from becoming free and falling into the anterior chamber, the posterior

chamber or into the vitreous. In the former case it will be possible to remove it without trouble; but if into either of the latter, the difficulty is likely to be great, and it may be insuperable. Generally speaking, the prognosis in a case of foreign body in the lens is more favourable than it is when the foreign body is lodged in other parts of the eye, excepting only those in which it is lodged in the iris.

A tremulous iris (iridodonesis) may show that a foreign body has caused a rupture of the zonule of Zinn and a subluxation of the lens, but care must be taken not to confuse the physiological iridodonesis, which is sometimes seen when the pupil is contracted in healthy eyes, with the pathological condition.

Prognosis of Traumatic Cataract.

Before proceeding to the prognosis of cataract, which is the result of an injury, it is essential to know whether the workman will submit to an operation for its removal. If not there is no need to consider the matter any further. A complete cataract, as long as it remains, is synonymous with a lost eye, and no employer can insist on his workman submitting to an operation no matter how

simple, no matter how safe. The man having lost the sight of the eye is entitled to compensation. Such, until it is altered, would seem to be the law of the land. A case illustrating this view came before the English law courts and was published in the papers in 1890. A man who was insured for £500 for total and irrecoverable loss of an eye received an injury which resulted in cataract. He declined operation but claimed full compensation, and received a jury's verdict in his favour. The company appealed; but the judges upheld the verdict, apparently ruling that it was "total and irrecoverable" loss of sight, because no one could guarantee that an operation would be the means of completely restoring sight.

It is not very uncommon for a small localized opacity of the lens to remain quite stationary. In such a case with fair vision, 6/60 or more, it will not usually be advisable to interfere surgically. If the patient is young and the accident has ruptured the lens-capsule, the crystalline may be absorbed and no operation may be called for.

In considering the prognosis of cataract the possibility of an opacity of the lens disappearing has to be reckoned with. If the injury is a capsular one, this occasionally happens, and more rarely it may

occur when the lens itself is injured. In a case which the author published in the *Lancet* some years ago a small piece of iron perforated the cornea and lens, and was seen floating freely in the vitreous. It was removed through a scleral incision by the electro-magnet. The puncture in the anterior capsule of the lens was connected with the puncture in the posterior capsule by a film of opacity. Recently I have seen the patient again, and the opacity and the capsular scars have entirely disappeared. The lens looks perfectly normal, and the sight is 6/6. But results such as this cannot always be expected, and more often the cataractous lens will have to be removed.

Prognosis is affected by the patient's age. A young man of twenty-five may obtain a clear pupil by a simple discission, whereas a man of forty-five will require an extraction, with possibly posterior synechia complicating the operation. The loss of a lens is a much more serious thing to one workman than it is to another following a different occupation, as much may depend on accuracy of sight and the need for orientation. If a workman cannot correctly judge the exact position of an object he ought not to work at the anvil, and he is not reliable with the hammer for any purpose, but he can drive

a horse and cart or he can be a mason's labourer. If one eye is a good one and the other requires a lens of 10 dioptres, very few workmen will consent to wear glasses; with such an amount of anisometropia they would rather give up the advantages of bin-ocular vision, if they are able to acquire it. But the operation for cataract is called for for other reasons than those connected with bin-ocular vision. An unused eye may become amblyopic, even in adults, which would be a very serious matter in the event of an accident disqualifying the other. After removal of the opaque lens the field of fixation is not dependent on the one eye alone, and even though objects are seen dimly with the aphakic eye, the advantage is considerable. But at first it is quite likely that the patient may be disappointed and that he may complain that the one eye bothers the other, and that he cannot judge distance nor localize objects.

It is a more serious disqualification for a driver to lose his right eye than his left, and in considering the prognosis of a cataract operation, due weight must be given to the fact that without a right eye the man may not be fit to drive a wagon, whereas after a successful operation he may be able to drive a motor.

Careful consideration must also be given to the general condition of the man. The employer, the insurance company, and the employed may alike wish to settle the matter without waiting to see the result of the operation, and therefore it is important to remember that an operation is considerably less likely to be successful if the patient is alcoholic, or if he suffers from Bright's disease or diabetes.

The prognosis of an operation for traumatic cataract may be less good than it is in other forms of opacity of the lens, because it usually happens that the effects of the accident are not confined to the lens alone, but usually the iris or ciliary body and the cornea participate. This is more especially the case when the wound was originally a septic one. In concussion, cataract if the opacity of the lens follows quickly after the receipt of the injury, it is probable that some rupture of the capsule has occurred; but if the opacity comes on later, it is more probable that it is due to interference with the nutrition of the lens. The absorption of a concussion cataract is less likely to happen spontaneously than is a cataract caused by direct injury; and those in which absorption occurs most quickly of all are those in which there is a decided rent in

the capsule which allows the imbibition of the solvent aqueous. A traumatic cataract with a capsular wound may on rare occasions, if left untreated, undergo a bony transformation which will eventually necessitate an operation under disadvantageous circumstances. A decided opinion as to the probable result of an operation cannot be given until due consideration has been devoted to any complicating symptoms that may be present. A subsiding cyclitis is very likely to be lighted up again by an operation, especially if it is necessary to extract rather than to remove the lens by discission. Posterior synechiae according to their extent are likely to interfere with a good result, and if there is hypotony, the case is not hopeful. In the next place the exact amount of sight must be estimated as far as possible. The lens being mature, we must find out whether the patient can recognize a candle flame in a dark room at a distance of three or four metres, and whether he can follow it with precision as it is moved along the arc of a semi-circle to his right and to his left and upwards and downwards.

If there is no perception of light a bad prognosis should be given and no operation undertaken. Any failure of light sense in any part of the field of vision indicates some complication that may be

fatal to a good result from operation, but which should not prevent its being performed, in most cases. The patient should of course be warned that his is not a hopeful case, but that as he has nothing to lose by operation carefully performed and everything to gain, he should undergo the temporary inconvenience of having it done. Probably such a patient has either a patch of choroiditis, a detached retina, or glaucoma. The choroiditis will not be affected by the operation ; the detached retina may by the sudden relaxation during the operation be increased, and the glaucoma may be either unaffected, made worse or relieved by it.

It is not always possible to say beforehand which of these conditions is present, but apart from the other symptoms some clue may lie in the nature of the defect when light is thrown upon the eye. If there appears to be a small scotoma and the light can be perceived in all directions around it, it is probably due to a central choroiditis. If a large segment is blind to the light it points to detachment of the retina, and if it is the nasal part of the field of vision that is lacking, it suggests that we have glaucoma to deal with. But these estimates are provisional, and it would be hazardous to lay much stress or base a confident prognosis upon them.

If the vitreous is fluid, it will probably manifest the fact by iridodonesis, and an operation, although it should be performed if there is projection of light, will probably be complicated by a considerable loss of the vitreous. The surgeon is sometimes called upon to decide whether a cataract is traumatic. A man presents himself with a more or less mature opacity of the lens and says that it has come on since an accident. But it may have pre-existed, and the accident may merely have called the man's attention to the condition of his sight, or he may be intentionally trying to deceive. In cases of doubt a careful consideration must be given to the man's account of the accident, and, if possible, independent witnesses of it should be interviewed. The surgeon should look for other injuries of the eye and note anything which corroborates or negatives the man's story. Is it a zonular cataract, and, if it seems possible that it may be congenital, are there any defects in the enamel of his teeth ? If the opacity is limited to one spot on the lens-capsule, it is primâ facie evidence in his favour. If the injury was one-sided, the other lens must be examined also for cataract, and if found, we must consider whether the accident was one likely to produce a concussion cataract in both eyes. Supposing the accident to have been caused

by a small foreign body perforating one eye, it is improbable that the other would have suffered also in the same way.

The surgeon will sometimes be asked whether a man suffering from a slightly cataractous condition of the lenses should return to his former employment, and careful consideration will have to be given to other points besides his present capacity before an opinion can be expressed. There are some occupations which seem to affect the progress of cataract unfavourably, and among these are those in which the labourer is exposed to extremes of heat and cold. No man with a tendency to cataract should work at the furnace : he is unfit to be a stoker, a farrier, a glass-worker, a baker or a cook, neither should he be employed by an ice-storage company. If he is young enough and has an opening to learn another trade, he should not be engaged in work requiring keen sight, such as printing. His work may be satisfactory at first, but as time goes on he will find it more and more difficult to be efficient, and will be thrown out of work years earlier than if he had been engaged in a less precise trade.

Traumatic Hyalitis.

Iritis and cyclitis are always associated with

some haziness of the vitreous, but in many cases the haze is not very marked and clears up with the amelioration of the primary disease. Traumatic hyalitis may manifest itself in two forms: (1) Suppurative; (2) with the formation of opacities. The first form is caused by septic injuries; and it is also the form which one sees associated with metastatic choroiditis. If pus is present in the vitreous, the prognosis is clear, for it is most improbable that the pus will become absorbed, and it is practically certain that the tension of the eye will diminish, and that in the end the eye will have to be enucleated. The second form in which opacities, either fixed or floating, occur, is more hopeful from a prognostic point of view. An important clue to the probable future of these cases lies in the movement, or absence of movement, of the opacities. If they move rapidly and freely, the vitreous is probably fluid and the prognosis is worse than it is in those cases in which the movements are either more sluggish or absent.

Opacities in the vitreous may be the result of an injury received some months previously; and they may also be the result of meningitis or other general disease. If they are few in number, and there is a clear history of an injury some little time pre-

viously, it is probable that they are traumatic in origin, and this view may be comfirmed by signs of recent traumatic iritis. If the opacities do not increase whilst they are being watched for a few weeks the prognosis is good. They may remain permanently, but there is reasonable hope that they will remain in statu quo and, when the patient becomes accustomed to them, that they will not interfere with his work. If, however, the tension of the eye is found to be diminishing, the outlook is darker and a very cautious prognosis should be given. But if the opacities are dust-like in appearance the surgeon should be on his guard in pronouncing them traumatic, for such ones are suggestive of a syphilitic origin.

Foreign Bodies in the Vitreous.

It may be laid down as a fairly general rule, but subject as all rules are to exceptions, that if there is a foreign body within the eye, that eye will be lost unless the foreign body is removed. In the case of the vitreous the foreign body frequently sets up a chronic hyalitis which is followed by shrinking of the globe, the tension becomes subnormal, and detachment of the retina or phthisis bulbi ends the tragedy. But in order to do this

it is usually the case that the foreign body is septic or oxidizable ; chemically indifferent foreign bodies may remain in the vitreous without inflammatory reaction. The oxidizable metals such as iron, steel and copper, are much more dangerous in the vitreous than in other parts of the eye ; for whereas, if they are aseptic, they may slowly oxidize in the anterior chamber without any irritation ; in the vitreous, however, they usually quickly cause trouble.

If the foreign body which has perforated the cornea or sclera is septic, the plastic form of hyalitis which follows gives little hope of resolution ; whilst although it may be aseptic yet, if it is an oxidizable piece of metal which is retained in the vitreous, the chemical action which ensues may be as destructive, although slower. When the foreign body is iron an early operation with the magnet is called for, if the eye is to be saved ; or if it is of some other substance, it will be necessary to try and remove it by forceps at the earliest possible moment before it becomes encysted, when the difficulty will be considerably increased.

In many cases haemorrhage into the vitreous or anterior chamber entirely masks the view, and the exact extent of the mischief is unknown ; but happily foreign bodies are more often iron than

any other metal, and thanks to the modern introduction of the electro-magnet the prognosis is infinitely more hopeful than it used to be. Such foreign bodies can often be removed without being seen. But the still more modern introduction of the X-rays has enabled us to deal both with invisible and non-magnetic, as well as with visible and magnetic, foreign bodies in a manner quite impossible a few years ago. We no longer have to wait for the absorption of blood to discover the seat of a foreign body, but by means of Mac-Kenzie Davidson's and other forms of localizer we can demonstrate with unerring exactitude the position of a foreign body in almost any part of the eye. The result of these advances is that the treatment is more certain and the prognosis more favourable.

The commonest position for a foreign body when it cannot be seen is behind the lower part of the ciliary body. In the case of an opaque lens the crystalline should be removed and a search made either at once or after the eye has become quiet. If the attempt to remove the foreign body is unsuccessful and the eye remains irritable, or more especially if the other one becomes irritable, an enucleation will have to be done. It is sometimes

difficult to decide, even after a successful operation, whether the inflammatory condition of the wound demands an enucleation. But if the wound has been septic from the beginning—that is to say, if the foreign body has carried in with it organisms which find in the vitreous a soil suitable for their growth—a general suppuration soon excludes any doubt. An aseptic foreign body which has not been removed by surgical means may remain quiescent and become fixed and encapsuled; or it may be constantly floating in the vitreous without causing either pain or inflammation, but in either case it is probable that the day will come when it will set up a hyalitis, a cyclitis or an iritis. The more free a foreign body is in the vitreous the less probability is there that it will become harmless by becoming encysted.

If the metal is one that oxidizes, it is probable that disorganization of the vitreous will occur more quickly than it will with metal that is not oxidizable.

An irregular shaped foreign body, which has produced a jagged wound of entrance is more damaging than one caused by a smooth pellet; and greater injury is, other things being equal, likely to result from a large than from a small foreign body. A

foreign body flying with force from the anvil or furnace may be considered to be aseptic.

It is well recognized that the prognosis in cases of foreign body in the vitreous depends considerably on the material of which the intruding substance is composed. Apart from the fact that iron is the only metal for which the magnet is available as a means of treatment, it is probably less obnoxious to the vitreous chemically than copper, whilst glass or stone are less irritating than either. Wood, on the other hand, is more injurious than metal or mineral from the greater likelihood of its being septic.

A practical point, for which we are indebted to Professor Snell, is to remember in forming a prognosis in the case of a steel foreign body in the vitreous, or in any other part of the eye, that if the steel has been hardened by the manganese process it is non-magnetic and cannot therefore be removed by the electro-magnet.

Haemorrhage into the Vitreous.

The prognosis of haemorrhage into the vitreous, the result of a blow or of a foreign body, is worse than it is in cases of spontaneous haemorrhage, not the result of local disease. One sometimes meets

with young men who are the subjects of the syndrome epistaxis, constipation, headaches and vitreous haemorrhage. In these cases we may see the complete absorption of very considerable haemorrhages occurring again and again, whereas a haemorrhage the result of an accident is much more frequently fatal to the eye. Haemorrhage may come from the rupture of the arteries or veins of the retina, or from the choroid, or from the ciliary body, or from the iris; andi f there has been a large outpouring, it is probable that weeks or months will elapse before it is absorbed, and in the meantime so much mischief may have been done that the eye has become a useless one. A smaller haemorrhage may not be so disastrous, and after some weeks a good amount of sight returns. In some even the sight becomes quite normal, a fact to be borne in mind in giving a prognosis. The younger the patient the more likely is absorption to occur. Peripheral haemorrhages often give rise to no subjective symptoms.

It is to be remembered that vitreous haemorrhages absorb much more slowly than those in the aqueous.

Haemorrhage into the vitreous is occasionally caused in workmen by the concussion of an explosion, without any rupture of the sclera taking place.

A rare result of a concussion is detachment of the vitreous, and if it occurred alone it might not be a serious matter, but as it is a probable forerunner of detachment of the retina it is of very dangerous import and the prognosis is correspondingly bad.

CHAPTER VII

Injuries of the Retina and Choroid : Foreign Bodies—Concussion — Anaesthesia — Ruptures — Haemorrhage — Retinitis Proliferans — Detachment —Choroiditis—Choroido-retinitis—Effects of Electricity—Suppurative Choroiditis—Metastatic Choroiditis.

INJURIES OF THE RETINA AND CHOROID.

Foreign Bodies

which after perforating the cornea or sclerotic have lodged in the retina or choroid occasionally remain quiescent for long periods. There is generally a scotoma in the visual field somewhat larger than one would expect to find from the size of the foreign body. But if firmly embedded and aseptic, and not situated in the yellow-spot region, the foreign body may interfere very slightly, or not at all, with sight. Nevertheless he would be a rash surgeon who prophesied that it would not be the cause of ultimate trouble. A foreign body may be apparently peacefully encapsuled when a slight blow on the eye, or a general concussion of any part of the body, detaches it from its bed and starts

fresh mischief which may end disastrously. But it must not be overlooked that before lodging itself in the retina or choroid very serious damage may have been wrought in the foreign body's transit of the eye. If there has been a wound of the ciliary body, or a jagged injury of the sclera, with possibly a loss of vitreous and signs of pus, accompanied by diminished tension, the treatment and the prognosis are alike evident. The eye will almost certainly be lost in most of such cases.

But if on the other hand the wound is a small one, caused by a pellet that is probably aseptic (even though it may have traversed the ciliary region before becoming located in the retina), then there is no urgency and an enucleation is not called for at once, and it may never be called for at all.

Concussion of the Retina

was described by Berlin many years ago under the name of Commotio Retinae. The immediate result is a considerable functional interference, objects appearing dim and lines broken. The iris is spasmodically contracted and does not respond to atropine. There is a pale area of opalescent opacity in the part of the retina opposite the site of the blow, probably caused by oedema or subchoroidal

haemorrhage, and the field of vision is concentrically contracted. But alarming as the appearances are they usually subside under appropriate treatment before the surgeon can be fairly called upon to give a definite prognosis.

Anaesthesia of the Retina.

But if on the other hand, after the symptoms of concussion have passed away, there are signs of anaesthesia of the retina, the case is likely to be a long and a serious one. The patient complains of inability to work, although there is no objective fault to be found with the eye ; the field of vision is contracted and form vision is sub-normal ; in fact, the case is so suggestive of malingering that the surgeon may unwittingly do an injustice to the man. If he gives an opinion adverse to the patient's statement and later on an optic atrophy supervenes, as may happen, he will get no sympathy for the difficulty of his position, but much discredit for his mistake.

Ruptures of the Choroid and Retina.

Amongst the many ill effects of a blow on the eye are ruptured choroid and ruptured retina ; and the possibility of their occurrence is to be remembered if on examining an eye soon after an injury

the details are hidden by intra-ocular haemorrhage. A few days later the absorption of the blood may make the lesion visible. Even a provisional prognosis should not be made until it can be said with certainty whether they have to be reckoned with or not.

In addition to blows, concussion from an explosion is an occasional cause of ruptured choroid. Or the concussion may have caused a "hole" in the macula, which has a punched-out appearance, its name being justified by the parallactic movements that are clearly visible. A permanent scotoma is likely to result.

Ruptures of the choroid are much more frequent than those of the retina, owing to the looser attachment of the latter and its greater elasticity. They may usually be distinguished from each other by the integrity of the retinal vessels in choroidal ruptures, although if the rent is limited to the outer coat of the retina the vessels may then be also uninjured. Other things being equal retinal rupture is a more serious accident than choroidal, and the atrophy which ensues is not confined to the injured part alone. Although a rupture of the choroid is never followed by choroiditis, probably because the injury is an indirect one, for direct

injuries are frequently the cause of choroiditis, yet it generally results in some deterioration of sight, and there is a permanent scotoma of the affected area. But if other parts of the field are good, and there is no serious complication, it may be fairly anticipated that the eye will remain a useful, though a damaged, one. If, however, the rupture, whether of the retina or of the choroid, is situated in the macula, a bad prognosis can with certainty be given.

It sometimes happens that the contraction of the scar in these cases causes detachment of the retina, and occasionally atrophy of the disc follows; but this latter is probably independent of the rupture, and is usually due to other mischief set up by the original accident. On exceedingly rare occasions a form of disseminated choroiditis has been known to follow a concussion, and less rarely a choroido-retinitis, either with or without rupture of the choroid. Beginning in the macular region with disturbance of the pigment epithelium it is apt to spread progressively but slowly until there is very considerable, and usually permanent, interference with sight.

The clue to the prognosis in ruptures of the choroid and retina is the site. If in the macular

region, the result will be very considerable loss of sight; but if well away from it, the ill-effects may be very slight.

Traumatic Retinal and Choroidal Haemorrhages often clear up and leave no worse sequel than a small patch of pigmented atrophy; but if they are in the macular region, the prognosis is more serious, and after they have become absorbed a retinal degeneration may permanently interfere with central vision. The red-coloured sight which sometimes accompanies these haemorrhages usually quickly disappears.

Retinal haemorrhages occur in phosphorus and lead poisoning and more rarely in arsenic, as well as from contusions. They usually take several months to absorb. Although the result may be a perfect restoration of sight, yet, if a contraction of the retinal blood-vessels occurs with atrophy of the nerve, an unfavourable prognosis should be given. A careful look-out should be kept, both for signs of commencing retinitis proliferans and for haemorrhagic glaucoma. Signs of atrophy of the retina should be sought for and here the perimeter is of great help. There may be concentric contraction of the visual field, with scotomata corresponding to the situation of the haemorrhages.

Given that the patient is a healthy man, the prognosis in traumatic retinal haemorrhages is much more favourable than it is in idiopathic haemorrhages. The more peripherally they are situated the less permanent deterioration of sight is likely to remain ; and the younger the patient the quicker is absorption likely to follow.

Choroidal Haemorrhages

are not common as the result of a contusion, and when they do occur they are usually complications of some other injury, upon which the prognosis depends. If in the macular region, they may be distinguished from retinal haemorrhages by the fact that they do not give rise to a positive scotoma, while retinal ones do.

Retinitis Proliferans

is seen as one of the rarer results of traumatic intra-ocular haemorrhage, or of chronic inflammation of the retina. The membranous connective tissue running into the vitreous and becoming organized is a picture that is not easily mistaken. The prognosis is very bad, for its course is not likely to be checked, and if there is any absorption, it must not be expected that sight will improve. It is more probable that the disease will run a chronic

course extending over many years, and during this period the tendency to the formation of connective tissue may continue; moreover, it would seem that retinitis proliferans, having occurred in one eye, is very apt to be repeated in the other on very slight provocation. Vision is often better than the ophthalmoscopic appearances would lead one to expect.

Detachment of the Retina

due to an accident is often a less serious condition than a similar detachment due to some idiopathic cause. Nevertheless, the prognosis is bad, for the detachment rarely becomes reattached, and it frequently increases. Early treatment is sometimes followed by success if the detachment is primary; but when, as is often the case, it is due to loss of vitreous, or choroidal haemorrhage, or cyclytic exudates, which in the course of organization cause a shrinking of the vitreous, the prognosis is extremely bad. When this shrinking takes place the only support of the retina is gone, and what is called detachment of the retina follows.

But detachment is often delayed until months after the injury, and then only comes on insidiously. There is too in these late cases often the

fear that not only will the injured eye be lost, but also that the other one will become sympathetically affected. When called upon to give a prognosis a careful perimetric examination should be made to try and determine the extent of the retina that is damaged. We must, however, guard against the fallacy of considering that a fairly good field means only a small detachment, because the detached part is often functionally active, and therefore is not recorded by the perimeter. The colour field, especially for red, will often demonstrate the extent of the detachment more accurately than the field for white.

Detached Choroid

may also occur on very rare occasions as the result of a blow. It is very difficult and sometimes impossible to diagnose. The tension is decreased, the waving movements seen in detachment of the retina are absent, and the case may be expected to end in phthisis bulbi.

Choroiditis,

or choroido-retinitis, is sometimes caused at a power station by the short circuiting of a current of electricity of high voltage. There is usually considerable visual disturbance with contraction of the field of

vision, hyperaemia of the iris and conjunctiva, and swelling of the macula from oedema and sometimes a central scotoma. But, alarming as the appearances are, the prognosis is good, for the symptoms generally subside in the majority of the cases in about a month, although the scotoma may remain and interfere with work for some time longer. But there is a minority of the cases in which the symptoms drag on for a period which seems interminable, and the most careful investigation is necessary, as it is not uncommon for malingerers to pretend that sight has been damaged by exposure to the glare of an arc lamp. It is often most difficult to prove or disprove whether the complaint is genuine or fraudulent. Cataract is a doubtful result of such a current.

A very similar condition may arise from a contusion, with grey patches around the papilla, diminished vision, spasm of the accommodation, accompanied by miosis or mydriasis. The prognosis is good, and the symptoms usually subside in about a week (vide Concussion of Retina, p. 127). A much more serious condition is that of

Suppurative Choroiditis,

or irido-choroiditis, associated with oedema of the

lids, chemosis, iritis, hypopion, great pain and rise of temperature. Such a clinical picture may be started by pathogenic organisms, the result of a septic infection from a wound. A similar condition may be initiated by an aseptic piece of copper. After a course of a month or six weeks, if the mischief is confined to the uveal tract and vitreous, it may terminate in an amaurotic condition with a yellow reflex from the fundus commonly known as "cat's-eye," and a so-called pseudo-glioma is formed. Or taking a somewhat more diffused course, it may end in panophthalmitis. In these cases it is often impossible to say whether the origin was a retinitis or a choroiditis. But the result will be the same, for a panophthalmitis once established, after severe pain and much suppuration, will terminate only with the utter destruction of the eye. The only grain of comfort to the surgeon and patient is the fact that there is no danger of sympathetic disease and usually no danger to life, for suppurative choroiditis does not cause sympathetic disease, and sympathetic disease does not cause suppuration. It is generally laid down that during the acute stage enucleation should not be performed, in consequence of the danger of setting up meningitis.

A form of choroiditis, the traumatic nature of

which may be overlooked, is that known as metastatic. There is considerable controversy as to how the infection of the globe is effected, but that it is a genuine metastatic infection there is no reason to doubt. The insignificance of the original injury, which may have been nothing more than a mere prick of some distant part of the body, provided it is associated with suppuration, is all that is requisite to produce a choroiditis that will ultimately destroy the eye. It is possible that such cases may occur without their true nature being suspected, and that the workman may consequently not receive the compensation to which he is entitled.

CHAPTER VIII

Malingering — Bin-ocular Amaurosis—Hemianopsia — Psychic Blindness—Cortical Blindness —Bin-ocular Amblyopia — Perimeter — Wernicke's Test — Mon-ocular Amaurosis and Amblyopia — Tests for Malingering.

Malingering.

We are occasionally asked to decide whether a man who states that he is blind is malingering, and easy as the answer appears, there is sometimes a good deal of difficulty in giving it. To the layman it seems that the ophthalmic surgeon has no justification for his existence if he cannot say off-hand whether a man is blind or not.

But before going into the difficulties of the question we must be sure of our premisses, and say what we mean by blindness. If we close our eyes, we consider that we are temporarily blind, but a strong light thrown on the eyelids will cause a contraction of the pupils ; moreover, we can distinguish whether the room is in darkness or not, and we can see shadows when the hand is waved between the

light and our closed eyes. It is clear then that we are not totally blind ; but the man who with his eyes open has no more sight than this may be considered so for all the practical purposes of life.

Malingerers may be divided into three classes : those who pretend to have a disease which they have not ; those who intentionally exaggerate the symptoms of a real disease ; and those who produce a disease for the purpose of getting recompense. In the first and second categories the most common eye disease to be simulated is amblyopia, and in the last the most common disease to be artificially produced is a conjunctivitis by means of foreign substances placed within the eyelids. Grains of sand or charcoal and fragments of tobacco are very usual foreign bodies employed for this purpose, and the fraud may sometimes be detected by finding particles in the conjunctival cul-de-sac.

Bin-ocular Amaurosis .

Blindness may be bin-ocular or mon-ocular, and it may be partial (amblyopia) or it may be complete (amaurosis), and the tests necessary to decide whether the man who says he is blind or partially blind in both eyes are different from those we use

in examining a man who says he is blind, or partially blind, in one eye only.

First, with regard to bin-ocular amaurosis, having satisfied ourselves that there is nothing wrong in the fundus we test the reaction of the pupils to light. If they are fully dilated and do not respond, and we are able to exclude the use of a mydriatic, there is primâ facie evidence that the man's story is true. A prism of 10° is placed in front of one eye, base in, the refraction having been corrected. The patient's attention is diverted by talking to him, and the prism is removed. If the eye does not then move inwards, it is practically certain that he is blind in one or both eyes. But if there is reaction to light and the eye moves inwards when we take away the prism, it is equally certain that there is some amount of sight. The reaction to light, however, taken alone and without regard to other symptoms is not sufficient evidence, for a man may have a very active contraction of the pupils to the stimulus of light and yet be quite blind. For instance, if the blindness is due to a double cortical lesion we should get total blindness from double hemianopsia, but the pupils would respond because there was no interference with the reflex arc. The retina and optic nerve are healthy and the

stimulus is borne by them across the commissure and along the tracts to the geniculate bodies and third nerve nucleus, to be returned along the third nerve, the ciliary ganglia and nerves to the sphincter of the pupil. The whole voyage is plain sailing in untroubled waters, for the centre for sight in the far-away cortex is not in the itinerary, and so we learn nothing about its condition.

In hystero-traumatism or in simulation of a bin- or mon-ocular amaurosis there are no ophthalmoscopic changes, but there is pupil reaction to light; in organic mischief the pupil is dilated and may not react to light. In organic mon-ocular cases small print cannot be read with the stereoscope, but in simulation it probably will be. Generally if the amaurosis is a pretension and not a fact, it is said by the patient to have come on suddenly in both eyes. This is rare in genuine cases, except occasionally in diabetic patients. A real amaurosis or amblyopia may be caused by excessive haemorrhage from any part of the body. It is not so frequently seen as the result of an injury as it is following a severe uterine, gastro-intestinal or pulmonary bleeding. Both eyes are usually affected. If a marked optic neuritis is present, or if there are extensive retinal haemorrhages as well, the prog-

nosis is serious, but even the cases which get well may show considerable deterioration of sight for months.

In cortical disorders of sight there are no ophthalmoscopic changes to be seen, nor will there be years afterwards, and the reaction of the pupil to light is normal. If the disease is one-sided, there will be hemianopsia of the opposite side of the field, but not blindness of one eye: if both sides are diseased, there will be blindness of both eyes from double hemianopsia. But if the occipital lesion is a very slight one, and confined to the superficial part of the cortex, it may manifest itself by loss of colour vision only. In addition to the hemianopsia a cortical lesion, such as haemorrhage or abscess, of the occipital lobes may be accompanied by psychical blindness, that is there is loss of visual memory, and things are only recognized by other senses than sight. Or such an injury may cause conjugate deviation to the opposite side. In hemianopsia the condition usually remains permanent for life; but occasionally, in traumatic cases, it disappears, the explanation probably being that the absorption of the haemorrhage relieves the pressure on the visual centre.

The condition of the eye-reflexes is an important

consideration in cases of possible malingering, and as they are not usually under the control of the patient, their evidence is very valuable. If a strong light is thrown on a normal eye suddenly we get two reflexes: (1) that of the iris, and (2) a blinking of the lids; but in a case of cortical blindness, although the first reflex may be quite active, yet the second, which requires visual perception, will be absent. The same absence of reflex will also occur if we suddenly approach the eye with the finger in a case of occipital blindness; but we must not overlook the possibility that a malingerer may have acquired sufficient control to prevent the reflex closing of the lids. But easy as it may seem to be to decide whether a man is totally blind or not, there are so many pitfalls that it is advisable to keep the patient under prolonged observation, in hospital if possible. During this time he should be carefully watched, and the fact that he is watched should be withheld from him. It is easy to feign blindness during a short examination, but it is difficult to continue it for several days.

Bin-ocular Amblyopia.

Should the complaint of the patient be not of amaurosis but of amblyopia only in the two eyes,

and the case a genuine one of injury to one cortical centre, unless we examine him thoroughly we may rashly come to the conclusion that he is malingering. We find his distant vision perfect, he reads the smallest print, the action of the pupils is normal, and there is no pathological change in the fundus of either eye; and if our examination ends here, we miss the important clue (hemianopsia) which an examination of the field of vision alone can supply.

And here it may be remarked that there is only one way of taking the field of vision, and that is with the perimeter. Holding up either the finger or test objects in various parts of the field may give us rough indications, but they are fallacious and of no scientific value. If in the case we are considering we find there is a homonymous hemianopsia following the recognized sharp lines of demarcation which we associate with genuine occipital lobe disease, we can be quite sure that it is not a case of malingering; for it is most improbable that a man belonging to the class from whom the working-men are usually drawn, has mastered any of the subtleties of perimetry. Wernicke has given us a valuable aid to the localization of the cause of the hemianopsia by means of his hemianopic pupillary test. If we throw a beam of light on the non-seeing half

of the retina only, and we find there is pupillary contraction, it is clear that there is no defect of the reflex arc, and that therefore the disease lies somewhere off this route on the branch line to the occipital lobe.

The disease then is in the optic radiations or in the cortex. Dufour is of opinion that if it is in the radiations the patient will be aware that he can see nothing in the affected part of his field; but if the disease is in the cortex he will not be conscious that he cannot see to the affected side, unless his attention has been drawn to the fact by the surgeon or by some accidental circumstance. This method of differentiation, however, is not accepted by all authorities, and therefore it is advisable to seek for other means of distinguishing between injuries which have affected the occipital lobe, and those in which the stress has fallen on the optic radiations. In this we are helped by, amongst other means, the consideration of associated symptoms, for it is most unusual to find that hemianopsia is an isolated symptom in disease of Gratiolet's radiations. The importance of differentiating lies in the presence or absence of this isolation, for it is disease of the neighbouring parts that will most probably affect the prognosis. In occipital disease, however, the

hemianopsia may be the only symptom, and then the prognosis is better, for the condition may last indefinitely and give rise to very little disability. Especially is this the case when the hemianopsia is a left-sided one, as then reading and writing are not much interfered with.

To return to our experiment with the iris-reflex, if on the other hand, when we throw the light as before on the blind half of the retina, we find that there is no contraction of the pupil, it is equally clear that some part of the sensory-motor reflex is affected. Unfortunately the test is not an easy one to apply.

If instead of hemianopsia we find great concentric contraction of the field we immediately suspect malingering or hysteria in cases in which there is no objective condition of the fundus to account for it.

In investigating the pupillary reflexes it is necessary to make quite sure that any anomaly is not due to posterior synechiae. Also it must not be overlooked that a mydriasis or a miosis may be due to atropine or eserine. Atropine dilatation may generally be exposed by throwing a strong light on the eye when, if the mydriasis is the result of atropine, the dazzling effect will quickly be ob-

served ; but if the eye is really amblyopic the brilliance will have but little effect. Mydriasis that is caused by atropine, is usually more complete than that caused by disease. If there is no evidence of an artificially produced mydriasis or miosis the indirect (consensual) reflex should be examined. Light being thrown on one eye it is noted whether the iris of the other, although shaded from the direct stimulus of the light, contracts. If so, there is nothing wrong with the receptive quality of the retina tested and no break in the conductive power of its optic nerve, or of the reflex arc in its totality. If conduction is quite interrupted in one optic nerve, there is blindness in that eye, and neither eye will respond to light thrown into the blind one, but both act equally if the light is thrown into the sound eye (consensual pupillary reaction). Consequently in disease of one optic nerve or retina the pupils are equal and appear to act normally.

There are many difficulties in the way in dealing with cases of double amblyopia—that is, in cases in which the patient says that as the result of an accident he has become partially blind in both eyes ; but they are not such as can prevent us from exposing an attempted fraud. We have to consider whether the accident was such an one as

would be likely to produce a double dimness. Both optic nerves might be injured by a concussion, by a fracture of the base, or by a haemorrhage into the sheaths; or a blow on both occipital lobes may have produced a double hemianopsia. A sphenoidal fracture or commissural injury might cause a double visual lesion. In forming an opinion the use of the ophthalmoscope will demonstrate the presence or absence of any ocular injury, and the general symptoms and history will almost certainly confirm or negative the patient's story. His field of vision having been taken he is placed before the test types and the sight of each eye is carefully noted in writing at the time. In a genuine case the vision of the two eyes will probably not be the same; but as a rule a malingerer will read down to a certain line with either eye indifferently and then come to a stop. The true amblyope may be a little uncertain about P's and F's and C's and G's in the smallest line he can read; but the false will read without the slightest hesitation or mistake down to the line at which he has decided to stop. He may generally be exposed by testing him at various distances, or, better still, by making use of mirror reading with reversed types.

Mon-ocular Amaurosis and Amblyopia.

In applying tests for malingering the first obvious necessity is to prevent the patient from closing either eye during the process. His refraction should be objectively estimated before beginning and where requisite spectacles should be worn; but if spectacles or prisms are used, he must not be allowed to look over the top of them. Especial care must be taken if stereoscopic tests are used, for should he know beforehand what effect closing his "bad" eye has, if he is a malingerer, his course of deceit is very simple. In applying prism tests he should not be asked if he sees double, but that should be taken for granted, and he should be asked if the double images are side by side or one above the other. The first question will probably be answered by a negative; but the second is not so easy for a malingerer to deal with.

Stereoscopic and other forms of box tests, requiring special apparatus, are omitted from consideration, as they are not usually necessary in testing working-men, and are only required in examining those who have some knowledge of optics. The simplest form is that in which the letter F is seen with one eye and the letter L with

the other. With binocular vision these are united to form the letter E, and variations, more or less complicated, are the foundation upon which stereoscopic tests are based.

Tests for malingering are numerous, and before giving an opinion adverse to the statement of a patient it is necessary to be quite sure that we are not doing the man an injustice. We must not therefore be satisfied with one test, but must apply many until no shadow of doubt remains.

The malingering may be merely an attempt to exaggerate a genuine failure of sight, and it is in these cases that the greatest care is necessary. A man may say that he cannot tell night from day with his damaged eye, and yet by means of prisms or other tests, we are convinced that his real vision is 6/60. If there is proof that the eye was a perfect one before the accident, the man, on account of the attempted fraud, may not deserve, but he may be entitled to, compensation.

Having examined the fundus and thoroughly tested the reaction of the pupils and the field of vision, we next hold up a finger eighteen inches in front of the good eye and ask him if he sees it. He will reply "yes"; then, without his moving his eyes, we hold the finger the same distance in

front of the other eye and ask him again. If he is malingering he will probably say "no," a reply which we know to be false, if we have previously found the good eye to have a perfect field, because in that position the finger is within the range of either eye.

If one eye is said to be quite blind, the field of vision should be taken first with the "blind" eye covered and then with it open. In a genuine case of mon-ocular blindness there will be no conspicuous variation in the two fields, but in a feigned case there will be a considerable difference.

In mon-ocular cases the author usually begins with a test that he does not think has been published. The patient is seated at a table with a prism of 12°, base up, in front of one eye. Three pennies are placed on the table in the form of a triangle, about four inches apart, and, without having seen them beforehand, the patient is asked to count them. If he says three, *without any hesitation,* his sight is almost certainly mon-ocular; but if he says six his sight is equally certainly bin-ocular. But although his sight may be bin ocular, yet one eye may be very defective, and the test may be made a little more searching by asking him how many "heads" and how many "tails"

he sees respectively. Further ocular proof of the diplopia can be demonstrated by asking him to pick up the coins. He will almost certainly begin with those nearest to him, when he will grasp the shadow and leave the substance. One advantage of this test is that it is not necessary to ask the patient if he sees double, or to give him any clue to the fact that it is in any way connected with diplopia.

Another simple test is to place a Maddox glass-rod before the "good" eye and ask the man to look at a candle at a distance of six metres. When he can see the streak of light ask him on which side of the candle it is. A malingerer can frequently be caught by this artifice, for of course if he is genuinely amaurotic he cannot see the candle at all. The fact that bin-ocular vision is present may often be demonstrated by means of Hering's drop test.

Prism Tests.—Graefe's Test.

Placing the patient at six metres from the test-types, we hold a prism of 10° in front of the sound eye with its base out in such a way that the thin edge is in front of the outer half of the pupil, the other eye being covered. With a little adjustment

diplopia will be produced, the patient seeing the types through the uncovered part of the pupil as well as through the edge of the prism, the two images being side by side. The prism is rotated slightly and the patient is asked to state the relative change in the position of the images. When the possibility of a mon-ocular diplopia is sufficiently apparent to the patient the other eye is uncovered and the prism placed completely in front of the sound one. If he has no sight in the eye of which he complains there will now be no diplopia; but if he is malingering there will be a diplopia, due to the test types being seen with each eye. If he confesses to a diplopia, he is asked to read the letters opposite the "good" eye, i.e. the series he sees with the "bad" eye. By this means, not only are we able to say that he sees with both eyes, but also we know the amount of sight he possesses in the "bad" one. Consequently the test is a very valuable one, demonstrating not only the fact of vision but also its acuteness.

Another prism test is to place a prism of 10° before one eye and ask the patient to walk up and down a staircase that he is not accustomed to. He will have no difficulty if his sight is mon-ocular, but considerable if it is bin-ocular.

Snellen's Test

consists of coloured letters, alternately dead red and dead green. Usually in England the word FRIEND is chosen, F I N being green and R E D red. A pair of spectacles with a red glass for one eye and a green one for the other is placed before the patient's eyes. The red glass of the spectacles neutralizes the green of the letters, and the green glass neutralizes the red ones, consequently the green letters cannot be seen through the red glass, nor the red ones through the green. With the spectacles on, taking care that the patient has not seen the letters beforehand and that he does not close one eye nor look over the top of the spectacles, he is asked to read the letters. If he reads F I N he is reading with the eye that has the green glass, if he reads R E D he is reading with the eye that has the red glass, and if he reads FRIEND he is reading with both eyes.

Javal-Cuignet Test.

The patient's refraction being corrected a sheet of test-type, J.I., is held at thirty-three centimetres from the eyes with a pencil interposed perpendicularly midway between his face and the sheet. He is asked to read the page, and if he does so fluently

without moving his head and without leaving out any words it is quite certain that he has good near sight with each eye. Another test is to paralyse the accommodation of the "good" eye with atropine. If the patient can read the newspaper he is doing so with his "bad" eye.

Segal's Test

is to dust a layer of lycopodium over a pair of plane glasses and ask the patient to look through them at a gas-burner, when he will see a halo round the light. The lycopodium is then wiped off the glass in front of the "good" eye, and if he still sees the prismatic effect he is looking with the "bad" eye.

Lens Tests.

Place a +1 D. sp. lens in front of the "bad" eye and a +18 D. sp. in front of the "good" eye and ask the patient to read the newspaper. If he does so, he is reading with the "bad" eye.

Another somewhat similar method is to place a +6 D. lens in front of the "good" eye (in addition to any correction his refraction may require in that eye), and then, holding a book in front of him at a distance of sixteen centimetres whilst he is reading

gradually recede the book to twenty centimetres or more. If he continues reading, he is using the "bad" eye, because at that distance the print is beyond his far point.

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